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THE LITTORAL ZONE BENTHIC MACROINVERTEBRATE COMMUNITIES OF 8 LOW ALKALINITY LAKES AND 12 LOW TO MODERATE ALKALINITY LAKES IN SOUTH-CENTRAL ONTARIO

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EXECUTIVE SUMMARY

The Aquatic Science Section of the Ontario Ministry of Environment and Energy (MOEE) conducted a programme to assess the composition of benthic invertebrate communities in acid-stressed softwater lakes. This report summarizes the results from the fall survey of the benthos in the littoral zones of 8 low alkalinity headwater lakes. This set of 8 lakes is then combined with similar results from 12 low to moderate alkalinity lakes and the 10 lakes with negative alkalinity are compared to 10 lakes with positive alkalinity. The biological parameters include benthic macroinvertebrate taxonomic richness, abundance, diversity (H') and evenness (J'). Both sets of lakes were sampled in the fall of 1988. The 12 lake set represents a reference set of Canadian Shield lakes that were originally summarized in Reid et al. (1994b).

The sampling protocol involved a kick-and-sweep technique that collected benthos at 5 sites in the nearshore area of each lake. Water chemistry data were also collected at a mid-lake station over the deepest spot in each lake. Herein we also describe the local geological characteristics, climate and vegetation of the region. In addition, we provide maps of the 8 study lakes and descriptions of the sampling locations in each lake.

The collections yielded a total of 325 species (199 genera) with a median of 75 genera per lake and a range of 47 - 91 genera. A median of 3440 individual organisms were enumerated from each lake with a range of 2189 - 14,250 organisms. The twenty-lake set shared 152 species and 115 genera, however only 11 taxa were found in all 20 lakes.

The positive alkalinity lakes had unique taxa in 9 orders or 12 taxonomic groups that were not found in the negative alkalinity lakes. Conversely there were unique taxa in 3 groups in the negative alkalinity lakes. This observation suggests that there are fewer species and genera among the low alkalinity lakes implying a positive relationship between the number of genera and lake alkalinity.

The taxa found only in one or more of the 10 negative alkalinity lakes comprised 74 species (49 genera), of which 43 species (35 genera) were found only in one lake. By contrast, there were 99 species (85 genera), found in one or more of the positive alkalinity lakes, of which 43 species (38 genera) were found only in one lake. There were 31 other taxa found in the 10 negative alkalinity lakes, whereas 56 additional species were also collected in the 10 positive alkalinity lakes. The 31 versus 56 count further supports the hypothesis of a positive relationship between the number of genera and lake alkalinity.

The total number of individuals, total number of genera, diversity (H') and evenness (J') data from each lake were standardized to Z-scores across the 20 lakes (i.e., a mean of 0.0 and a SD of 1.0) and plotted on bivariate axes to search for groupings among the lakes. The result highlights a distinct division between negative and positive alkalinity lakes where fewer genera were evident in the negative alkalinity lakes. One other general trend evident from these plots is the low diversity and evenness of Harp, Hamer, Hunter and Young lakes. Factors including geography, topography, geology and benthos diversity and evenness suggest that these 4 lakes belong to a biogeographic region that differs from that of the other 16 lakes.

Correlation coefficients between alkalinity, number of genera, number of individuals, diversity (H') and evenness (J') were computed for each set of 10 lakes as well as the combined set of 20 lakes. The results indicate a positive relationship between the number of genera and lake alkalinity which holds for all data sets, separately and combined.

The littoral benthic community of negative alkalinity lakes is represented by fewer genera, and is dominated by the Diptera (flies, mosquitoes and midges). Most of these dipterans are midges from the family Chironomidae. In this survey 45% of the individuals belonged to the order Diptera. In addition, over two-thirds of the Diptera belonged to the Chironomidae. The average abundance of the Chironomidae in negative alkalinity lakes (3540) was 3 times greater than that in the positive alkalinity lakes (1164).

If the water chemistry of the negative alkalinity lakes improves in response to emission controls we expect to see an increase in the number of genera in the littoral benthic communities and a decline in the total number of chironomids. These features will be examined in subsequent reports as time-trend data are collected.

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INTRODUCTION

In 1988, the Ontario Ministry of Environment (now called the Ontario Ministry of Environment and Energy, MOEE) initiated a biomonitoring programme to assess temporal trends in the composition of benthic invertebrate communities in acid-sensitive, softwater Precambrian Shield lakes. This work represents the central Ontario component of the federal-provincial Long Range Transport of Airborne Pollutants (LRTAP) programme that includes an assessment of regional changes in the health of inland aquatic ecosystems associated with reductions in sulphur emissions (Shaw et al. 1992). A standard set of survey protocols was used by members of the LRTAP programme to permit comparisons among data sets collected from 6 areas in eastern Canada (Reid et al. 1994a). Our goals in this LRTAP programme are: (1) to estimate common species distributions; (2) to compare relative abundances among lakes and among regions; and (3), to detect the response of invertebrates to anticipated changes in water chemistry associated with emission controls.

This report describes the 1988 fall synoptic survey of the littoral benthic macroinvertebrate community in 8 low alkalinity lakes. Herein, we also describe the physical, chemical, and geological attributes of these 8 lakes. This set of 8 low alkalinity lakes is then combined with 12 low to moderate alkalinity lakes and differences between negative and positive alkalinity lakes are examined with respect to benthic macroinvertebrate taxonomic richness, abundance, diversity (H') and evenness (J'). This study complements the original LRTAP programme by focusing on the invertebrates in extremely acid-sensitive lakes with negative alkalinity values (i.e., lakes with little or no buffering capacity). The LRTAP 12 lake set was sampled in a similar way in the fall of 1988. The 12 LRTAP lakes serve as a benchmark or reference-set of Canadian Shield lakes. The full results from the 12-lake study are summarized in Reid et al. (1994b).

STUDY LOCATION

All of the study lakes are located in south-central Ontario in the county of Haliburton or in the Districts of Nipissing, Muskoka or Parry Sound. The nearest major urban centres are Peterborough (120 km) and Toronto (200 km) to the south and North Bay (130 km) and Sudbury (200 km) to the north (Fig. 1). The 20 lakes are scattered over an area that spans 78°16' to 79°52' in longitude and 45°05' to 45°45' in latitude (Tables 1, 8 and Fig. 1).

Climate and Vegetation

The range in average annual precipitation is 90-110 cm in the Dorset area (30-year record). A total of 240-300 cm of snow falls each year, generally between December 1 and April 10. January temperatures average -10°C while in July, temperatures average 17.5°C. Mean annual temperature is about 5°C. Lakes are generally ice-covered from the first week of December to mid-April.

The study area is situated in the Great Lakes - St. Lawrence forest, a region characterized by eastern white pine (*Pinus strobus*), red pine (*Pinus resinosa*), eastern hemlock (*Tsuga canadensis*) and yellow birch (*Betula alleghaniensis*). Other common species include beech (*Fagus grandifolia*), white oak (*Quercus alba*), sugar maple (*Acer saccharum*), basswood (*Tilia americana*), eastern white cedar

(*Thuja occidentalis*), red maple (*Acer rubrum*), red oak (*Quercus rubra*), white birch (*Betula papyrifera*) and trembling aspen (*Populus tremuloides*). Generally, forest stands on the north-facing slopes are coniferous, whereas south-facing slopes are characterized by deciduous trees. Coniferous trees are also common along the shore of each lake.

Geology

The study lakes are situated on the Canadian Shield, an expanse of Precambrian bedrock. The last period of mountain building of the Precambrian period was the Grenville orogeny which formed the Grenville province, a roughly rectangular strip of land 400 km wide and 2000 km long stretching from Georgian Bay to Labrador. The bedrock of the Grenville province is granitic in composition, usually including granitic gneisses and migmatites with marble, quartzite, amphibolite and various igneous intrusives (pegmatites, diorites and metabasics) of less importance (Jeffries and Snyder 1983). During the Pleistocene period, four glacial advances, including the most recent or Wisconsin glaciation, have rounded and polished the rock outcrops of the Grenville province. These glacial advances lowered the relief, scoured many river and lake basins and redeposited glacial debris, including moraines, eskers, outwash sands, gravel and lake sediments. Minor till plains (i.e., continuous moraine deposits >1 m thick) and thin till deposits (i.e., <1 m thick) interrupted by rock ridges are the dominant surficial deposits.

Water Chemistry

The conductivity, major ions and nutrient levels in lakes in this area are typical of nutrient poor, low alkalinity Canadian Shield lakes. The nutrient data (total phosphorus and nitrogen) reveal that four of the 8 lakes are oligotrophic (Dillon and Rigler 1974) and four have total phosphorus concentrations greater than 10 $\mu g \cdot L^{-1}$ (Table 2). Conductivity ranges from 19 to 40.6 $\mu S.cm^{1}$ and the alkalinity (ALKT TFE) ranges from 16 to 39 $\mu eq \cdot L^{-1}$ or the Gran alkalinity (ALKTI GRAN) ranges from -1 to -32 $\mu eq \cdot L^{-1}$. The pH, total phosphorus and TKN (Total Kjeldahl Nitrogen) ranges are 4.44-5.73, 3.8-21.0 $\mu g \cdot L^{-1}$ and 180-570 $\mu g \cdot L^{-1,}$ respectively. The sulphate range is 5.3-10.8 $\mu g \cdot L^{-1}$.

METHODS

Lake and Site Selection

These 8 lakes were selected from the MOEE database to span a range of negative alkalinities (i.e., <0 $\mu eq \cdot L^{-1}$). These lakes lie within the area bounded by Parry Sound, Gravenhurst and Algonquin Provincial Park (Fig. 1). Hunter Lake is located in the historic Lake Algonquin basin, formed after the Wisconsin glaciation (335 m above sea level). The other 7 lakes lie in the Algonquin-Haliburton Highlands (>340 m above sea level; i.e., Clayton, Clyde, Doughnut, Pine, Pipio, Sugarbush and Tonakela lakes). All 8 lakes are small headwater lakes (6.9 ha to 53.6 ha) that are subject to high sulphate deposition (0.75-1.25 $g \cdot m^{-2} \cdot yr^{-1}$, Neary and Dillon 1988).

The field crew circumnavigated each lake and recorded the relative frequencies of various substrate types between the shore and a depth of approximately 1 m. Five sites were then selected to include the predominant substrates; typically bedrock (BDR) and boulders (BOU), cobble (COB), pebble (PEB), silt (SLT) and/or coarse sand (CSD) with macrophytes and highly organic detritus and woody debris (LOS). Only 4 sites were sampled in Clayton Lake because of minimal habitat differences.

Sampling Procedures - Benthos Collection - Field Methods

Because of site-specific differences in habitat complexity and sampling efficacy, we collected benthic invertebrates with a kick-and-sweep method standardized to a constant period of time rather than a standard unit of area (e.g., Okland and Okland 1979). Our simple kick-and-sweep method usually collects a large percentage of all species in proportion to their abundance (Elliott 1977). However, the rationale for a fixed time rather than a fixed areal unit has been challenged because the area covered during a fixed time will vary according to the habitat and the water conditions. Consequently, fixed time sampling provides information on relative abundance and species occurrence whereas areal sampling estimates absolute abundance.

Benthic invertebrates were collected for 10 minutes at each site along a varying number of transects (0-1 m depth) located 5 m apart. On each transect the collector waded out to a depth of 1 m. The substrate was gently kicked to disturb and dislodge the surface sediment and associated detritus. The disturbed material was swept up with a standard D-frame, 250 µm mesh net and transferred to a plastic bucket as the collector waded slowly towards the shore. After 10 minutes the bucket was sealed and labelled.

Sampling Procedures - Benthos Collection - Laboratory Processing

The samples were sieved through 6250 and 1000 μm mesh to separate the coarse detritus and large invertebrates from the finer material. The >1000 μm fraction and any invertebrates retained by the 6250 μm mesh were separately preserved in 70% ethanol. After several weeks the sieved fraction (i.e., >1000 μm fraction) was stained to assist in removing the remaining macroinvertebrates from the debris (i.e., using a mixture of 10 g of Eosin B and 10 g Biebrich Scarlet in one litre of water at the rate of 20 mL of the resultant dye solution per 1 litre of sample). The samples were stained for two days, washed, and then sorted without sub-sampling to remove the remaining animals. The resultant samples of benthic invertebrates were identified to the lowest practical taxonomic level. In most instances, the taxonomic resolution was to the genus or species level. Bohdan Bilyj (Biotax) identified all of the invertebrates. Where more than 300 individuals of major groups like the chironomids were found, subsamples of representative individuals were identified and the counts were adjusted to reflect these proportions. In some instances, subsampling resulted in data entries with decimal places.

Water Chemistry

Water samples were collected while anchored over the deepest spot in each lake. Standard protocols for sampling (Locke and Scott 1986) and analysis (Locke 1985) were followed. Once collected, sub-samples of water were poured into the appropriate bottles for subsequent chemical analysis. The chemical parameters included alkalinity (ALKTI), aluminum (AL), calcium (CA), chloride (CL), conductivity (Cond25), dissolved organic carbon (DOC), dissolved inorganic carbon (DIC), iron (Fe), potassium (K), magnesium (Mg), sodium (Na), nitrogen (TKN), total phosphorus (TP), pH and sulphate (SO_4). The results represent volume-weighted estimates based on fall samples only.

RESULTS AND DISCUSSION

Lake and Site Descriptions

The biomonitoring lakes are all small (6.9-53.6 ha) headwater lakes in 3 tertiary watersheds in south central Ontario (Table 1 and Fig. 1). The three tertiary watersheds are:

1. 2EB - lakes in this watershed flow through the Moon River or the Go-Home River then into Georgian Bay and Lake Huron (i.e., Clayton, Doughnut, Hunter, Pipio and Tonakela).
2. 2EA - lakes in this watershed flow into the Magnetewan River then into Georgian Bay and Lake Huron (i.e., Pine and Sugarbush).
3. 2KD - lakes in this watershed flow into the St. Lawrence drainage basin via the Ottawa River and the Upper Madawaska River (i.e., Clyde Lake).

Chemistry

The water chemistry confirmed the softwater nature of the lakes (i.e., conductivity 19-40.6 µS.cm^{-1}) ranging from low DOC (i.e., 1.7 mg·L^{-1}, Clayton Lake) to moderately coloured (8.7 mg·L^{-1}, Pipio Lake; Table 2). The lakes are extremely acid sensitive (alkalinity (ANC) <10 µeq·L^{-1}) to moderately sensitive (ANC >100 µeq·L^{-1}) with respect to the potential for acidification. The alkalinity (ALKT TFE) ranges from 16 to 39 µeq·L^{-1} with Gran alkalinity (ALKTI GRAN) ranging from -1 to -32 µeq·L^{-1}. The pH, total phosphorus and TKN (Total Kjeldahl Nitrogen) ranges are 4.44-5.73, 3.8-21.0 µg·L^{-1} and 180-570 µg·L^{-1}, respectively. The sulphate range is 5.3-10.8 µg·L^{-1}.

Benthos

Five sites were sampled in each lake, with the exception of only 4 sites in Clayton Lake. Because of minor inconsistancies in the identification of some taxa (e.g., some of the immature chironomids) most of the comparisons were done at the genus level or higher. The number of genera in the 8 lakes varied from 47 to 68 (mean = 58.6; Table 3), and the number of individuals collected ranged from 2467 to 14,250 (mean = 5286; Table 3).

A summary of the abundance data for each lake is presented in Table 4. The species summary is provided in Table 5. Clyde and Hunter supported the fewest species among the 8 lakes. However, the most individuals were collected from Hunter Lake.

In all instances the most common taxa were the Diptera representing the greatest number of species (51%) and individuals (70%; Table 6). Overall 67% of the Diptera belonged to the family Chironomidae-Subfamily Chironominae. For example, the data for Hunter Lake was dominated (71%) by four species of Diptera (Chironomidae, Sub-family Tanypodinae, Procladius (Holotanypus) sp.; Sub-family Orthocladiinae, Zalutschia obsepta; Sub-family Chironominae, Tribe Chironomini, Dicrotendipes modestus and Microtendipes pedellus). In the other 7 lakes these four ubiquitous Chironomids represented an average of 29% of the animals at the genus level and a mean of 44% of the total Diptera abundance. Further examination of the numerically dominant species revealed that 8 species played major roles in determining the total numbers of four other orders (i.e., Amphipoda, Ephemeroptera, Odonata, and Trichoptera). The Amphipoda and Ephemeroptera were each dominated by one species common to all 8 lakes. This was the ubiquitous species Crangonyx laurentianus for the Amphipoda which comprised 100% of the amphipods collected in four lakes (Clayton, Clyde, Doughnut and Pipio). Although a second amphipod species was abundant in Pine Lake (79%), the only other occurrence of Hyalella azteca was a single specimen found in each of Doughnut and Hunter lakes. The Ephemeroptera were dominated by the species Leptophlebia cupida, which comprised an average of 82% of the mayflies collected in 4 lakes (Clayton, Hunter, Pipio and Sugarbush). The mayfly Eurylophella temporalis was numerous in Pine Lake (74%) and present in all but Clyde Lake. The Odonata were a dominant order in 4 lakes (Clayton, Clyde, Doughnut and Hunter). The species Leucorrhinia hudsonica was abundant in Clyde and Tonakela (71%, 65% respectively) and present in 5 other lakes (Clayton, Doughnut, Hunter, Pipio and Sugarbush). Similarly Libellula julia dominated Doughnut (54%) and was present in the same group of lakes as L. hudsonica A third species, Ischnura verticalis was abundant in Hunter Lake (56%) although only

5 specimens were found in a second lake (Pipio). The dominant Trichoptera in Sugarbush and Tonakela lakes was Polycentropus sp.1 (41%, 76% respectively). This genus was found in all 8 lakes.

Diversity and Evenness

Diversity indices combine information on the species that are present and their relative abundance. Here the Shannon - Wiener diversity index (H') was calculated using data condensed to the genus level of taxonomic resolution (i.e., species were combined to the genus level because of some inconsistancies in the species level identifications). The H' index was computed using the following formula:

$$H' = - \sum (n_i/N) \log (n_i/N)$$

where n_i is the number of individuals in genus i and N is the total number of individuals. A high diversity index means a large number of the genera were found in a sample relative to the number of individuals. A low value implies that the sample is dominated by a small number of genera. H' in the 8 lake survey ranged from 0.921-1.304 with an average of 1.168 (Table 3). H' values were compared using the formulae provided by Zar (1984). These formulae involve pair-wise comparisons between H' values for each lake (see Table 7 and below).

Evenness (J') or equitability also refers to the distribution of individuals with respect to the number of genera, but evenness is standardized to range from 0 to 1. The formula is:

$$J' = H' / \log (S)$$

where (S) is the total number of genera in the sample. A value of 1.0 implies that each genus has an equal number of individuals, whereas values approaching 0.0 indicate that most of the individuals were from only one genus. The evenness values for this study ranged from 0.542 to 0.728 with an average of 0.662 (Table 3).

The diversity indices (H') for the 8 low alkalinity lakes were ranked lowest to highest along with the corresponding J' values (Table 7). Several groups of lakes with similar diversities were observed to have similar J' evenness. Hunter and Sugarbush lakes were distinctly low in diversity and evenness (H' 0.921, 1.068 and J' 0.542, 0.587 respectively). Clayton and Clyde lakes had the next greatest diversity (1.154, 1.178), although their respective equitability (0.663, 0.704) suggests that these lakes differ. Tonakela, Pipio and Pine lakes were grouped together with similar diversity (1.213, 1.240 and 1.271, respectively) and similar evenness (0.685, 0.692 and 0.694, respectively). Doughnut Lake had the greatest diversity (1.304) and evenness (0.728) indicating that the distribution of individuals with respect to the number of genera is more even than that found in the other lakes.

Z-score Plots (8 lake data set)

The total number of individuals, total number of genera, diversity (H') and evenness (J') data from each lake were standardized to Z-scores across the 8 lakes (i.e., a mean of 0.0 and a SD of 1.0) and plotted on bivariate axes to search for groupings among the lakes (Fig. 2). Hunter had fewer genera and more individuals than the average of all the lakes. This separation is due to 4 species of Diptera (Chironomidae, Sub-family Tanypodinae, Procladius (Holotanypus) sp.; Sub-family Orthocladiinae, Zalutschia obsepta; Sub-family Chironominae, Tribe Chironomini, Dicrotendipes modestus and Microtendipes pedellus) which dominated (71%) the collections from Hunter Lake. Clayton and Clyde had fewer genera and fewer individuals than the other lakes. Pine and Sugarbush showed similar numbers of genera and individuals (68, 66 and 5009, 4982, respectively). However, the Sugarbush Z-score position was influenced by its low H'. This H' value reflects the fact that the benthos in Sugarbush Lake is dominated by two species representing 58% of the total abundance. These taxa are the Ephemeroptera, Leptophlebia cupida and Diptera: Chironomidae, Subfamily Chironominae, Tribe Chironomini, Microtendipes pedellus. By contrast, Doughnut, Pipio, Pine and Tonakela lakes had more genera than the 8 lake average and fewer individuals.

The average number of individuals in this survey is influenced by Hunter Lake which was 2.7 times greater than the average because of four chironomid taxa (see above). As a result of this dominance, the H' for Hunter Lake reduces the overall average H' for the survey. The plot of the number of individuals versus H' shows Hunter Lake above the mean number of individuals line while having the lowest H' of the survey. The remaining lakes fall below the mean number of individuals with

Clayton and Sugarbush showing less than the average H' as well. Clyde, Doughnut, Pipio, Pine and Tonakela showed values that were larger than the mean H'.

Combined Littoral Zone Benthic Macroinvertebrate Data

The combination of the aforementioned 8 lakes with 12 additional lakes (Table 8) provided two sets of 10 negative and 10 positive alkalinity lakes. The resulting data set comprised 325 species (199 genera) identified by the same taxonomist over the same period of time. The twenty-lake set shared 152 species and 115 genera. Although some species were not found in all of the lakes, many genera were present in all lakes.

The negative alkalinity lakes provided a total of 225 species (139 genera) of which 74 species (49 genera) were unique to this set of lakes (Table 12). Unique species and genera were defined as those taxa found exclusively in one set of the 20 lakes. These 49 unique genera included 35 rare genera which were found only in one lake. Those genera found only in the negative alkalinity lakes and found only in one lake are highlighted in Italics and underlined in Table 9. The total list of rare species collected from only one negative alkalinity lake includes 81 species (65 genera). These rare species represent 36% of the total number of species and only 8 of these taxa were represented by 10 or more individuals. The 8 rare species with counts of more than 10 individuals were found in four Orders which were: **Isopoda**: Asellus forbesi (115); **Odonata**: Enallagma vesperum (35); **Hemiptera**: Hesperocorixa kennicott (13); and **Diptera**:Chironomidae- Subfamily Tanypodinae: Larsia indistincta (93); Subfamily Orthocladiinae: Corynoneura sp.1 (10); and Heterotrissocladius changi (10), Psectrocladius (s. str.) Sordidellus (117); and Subfamily Chironominae, Tribe Chironomini: Pseudochironomus sp.1 (472).

The positive alkalinity lakes had 251 species (175 genera) of which 99 species (85 genera) are unique to this set of 10 lakes. Among these taxa there were 43 rare species (38 genera) found only in one lake. A listing of these 43 species is presented in Table 10. The total list of rare species found only in one positive alkalinity lake includes 75 species (59 genera). These rare species represent 30% of the total number of species collected and only 4 of these numbered 10 or more individuals. These 4 species represented 4 Orders which were: **Hydracarina**: Unioncola crassipes laurentiana (25); **Odonata**: Leucorrhinia frigida (30); **Diptera**: Chironomidae- Subfamily Orthocladiinae Zalutschia sp.1 (11); and **Pelecypoda**: Musculium securis (17).

Those species found in both negative and positive alkalinity lakes are listed in Table 11. The species shared by all 20 lakes are in Italics and underlined. Out of a total of 325 species comprising 199 genera only 11 taxa are shared among all 20 lakes. These taxa included an aquatic earthworm, a mayfly and 9 chironomids, of which several were undistinguished groups of species.

A further listing of taxa restricted to subsets of either the 10 negative or 10 positive alkalinity lakes is presented in Table 12. None of these taxa were common throughout their respective set of lakes. The taxa found only in one or more of the 10 negative alkalinity lakes (Table 12) consisted of 74 species (49 genera), of which 43 species (35 genera) were found only in one lake. Among this latter group, only **Isopoda**: Asellus forbesi (115) and **Hemiptera**: Hesperocorixa kennicotti (13) in

Skidway Lake had an abundance greater than 10 individuals. The negative alkalinity lakes did not have unique taxa belonging to 9 orders or 12 taxonomic groups that were unique to the positive alkalinity lakes (Table 12). These groups were: Turbellaria, Hirudinea, Amphipoda, Hydracarina, Ephemeroptera, Plecoptera, Diptera: Chironomidae- Subfamily Podonominae, Subfamily Diamesinae, Subfamily Prodiamesinae, Subfamily Chironominae-Tribe Chironomini and Gastropoda and Pelecypoda. Conversely the positive alkalinity lakes did not have unique taxa belonging to 3 taxonomic groups that were unique in the negative alkalinity lakes. These groups were: Isopoda, Hemiptera and Diptera:Tabanidae and Culicidae. This observation suggests that there are fewer species and fewer genera among the low alkalinity lakes implying a positive relationship between the number of genera and lake alkalinity.

The taxa found only in one or more of the positive alkalinity lakes comprised of 99 species (85 genera), of which 43 species (38 genera) were found only in one lake. Among these 43 rare species only **Pelecypoda**: Musculium securis (17) in Harp Lake had an abundance greater than 10 individuals. The remaining 56 taxa belonged to the Turbellaria, Oligochaeta, Hirudinea, Hydracarina Ephemeroptera, Odonata, Plecoptera, Trichoptera, Coleoptera and Diptera. These 56 taxa contrast with the corresponding 31 taxa from the negative alkalinity lake set. The 56 versus 31 count further supports the hypothesis of a positive relationship between the number of genera and lake alkalinity.

Z-score Plots (20 lake data set)

The total number of individuals and total number of genera, diversity (H') and evenness (J') data from each lake were standardized to Z-scores across the 20 lakes (i.e., a mean of 0.0 and a SD of 1.0) and plotted on bivariate axes to search for groupings among the lakes (Fig. 3). The graphs reveal a distinct division between negative and positive alkalinity lakes where fewer genera are evident in the negative alkalinity lakes. An exception to this is Skidway Lake which had an inordinately high number of genera (91) and high abundance (8896) despite having a negative alkalinity.

With the addition of the 12 lake data set, it becomes apparent that the negative alkalinity lakes are unique because they support fewer genera (i.e., compare Figs.2 and 3). Another general trend is the low diversity and evenness of Harp, Hamer, Hunter and Young lakes. These 4 lakes are located in the historic Lake Algonquin basin, formed after the Wisconsin glaciation (<335 m above sea level, Fig.1). The glacial advance lowered the relief, scoured many river and lake basins and redeposited a thin till (i.e., <1 m thick) over the rock ridges. These factors of geography, topography and geology may explain the unusual diversity and evenness of these lakes, suggesting that these 4 lakes may belong to a different biogeographical region, relative to the other 16 lakes. Perhaps Skidway Lake should also belong to this group of 4 lakes, although there are other factors that are unique to this lake alone.

Correlations between the biological metrics and alkalinity

Correlation coefficients between ALKTI, number of genera, number of individuals, diversity (H') and evenness (J') were computed for each set of 10 lakes and then with the combined set of 20 lakes

(Table 13). Correlation coefficients range in value from -1.0 to 1.0. A correlation coefficient of zero means that 2 variables are not correlated. By contrast, two variables are perfectly correlated if a -1.0 or 1.0 is observed.

The negative alkalinity lakes revealed strong relationships between H` and J`, between J’ and the number of individuals, and between the number of genera and alkalinity (Table 13). The positive alkalinity lakes showed a similar correlation between H’ and J’, and between the number of genera and alkalinity. The correlation between J’ and the number of individuals in this latter set of lakes was much weaker. The 20 lake set revealed a strong correlation between H’ and J’, and the number of genera with alkalinity. Surprisingly J’ was also correlated with alkalinity for the set of 20 lakes. These results indicate a positive relationship between the number of genera and lake alkalinity which holds for both data sets, separately and combined. The relationship between H’ and J’ is expected given their simple formulas. The only remaining correlation of interest is the negative correlation between J’ and alkalinity. This suggests that evenness declines as alkalinity increases. Because this relationship is counter-intuitive we suspect that other factors are involved. This issue will be addressed in a future report.

SUMMARY

Eight lakes were sampled in the fall of 1988 in order to characterize the littoral zone benthos from low alkalinity lakes in south-central Ontario. This report summarizes the results of this synoptic 8 lake survey. On average, 5286 organisms from 59 genera were collected from each lake. Diversity indices calculated at the generic taxonomic level ranged from 0.921 to 1.304 with an average of 1.168. Sixty-four species were unique to only one of the lakes, whereas 18 taxa were collected from all 8 lakes.

The combination of the aforementioned 8 lakes with 12 additional lakes from the LRTAP biomonitoring programme provided two sets of 10 negative and 10 positive alkalinity lakes. The resulting data set comprised 325 species (199 genera) identified by the same taxonomist over the same period of time. The 20 lake set shared 152 species (115 genera) of which 11 ubiquitous species (and genera) were found in all 20 lakes. None of the taxa found exclusively in one set of lakes were common to all of the 10 lakes in that set.

The 10 negative alkalinity lakes provided a total of 225 species (138 genera) of which 74 species (49 genera) were not found in the other 10 lakes. These 49 unique taxa comprised 35 genera found in only one lake. Of these taxa, only Isopoda: Asellus forbesi (115) and Hemiptera: Hesperocorixa kennicotti (13) in Skidway Lake were represented by more than 10 individuals. By contrast, the 10 positive alkalinity lakes had 251 species (175 genera) of which 99 species (85 genera) were unique to this set of lakes. Among these taxa there were 43 rare species (38 genera)found in only one lake.

Only **Pelecypoda**: Musculium securis (17) in Harp Lake had an abundance greater than 10 individuals. None of the unique taxa in the negative alkalinity lakes belonged to the 9 or 12 taxonomic groups that included unique taxa in the positive alkalinity lakes.

The number of genera was positively correlated with lake alkalinity suggesting that there were fewer genera in the littoral zones of low-alkalinity lakes. This study revealed that the littoral benthic community of negative alkalinity lakes is represented by fewer genera, but dominated by the Diptera (flies, mosquitoes and midges). Most of these dipterans are midges from the family Chironomidae. Diptera inhabit all types of aquatic environments; because of very short development periods in many species, they are able to utilize ephemeral aquatic habitats as well as permanent ones. About 40% of all species of aquatic insects belong to this order, and at least a third of the aquatic Diptera species are in one family, the Chironomidae (Hilsenhoff 1991). In this survey 45% of the individuals belonged to the order Diptera. In addition, over two-thirds of the Diptera belonged to the Chironomidae. The average abundance of the Chironomidae in negative alkalinity lakes (3540) was 3 times greater than that in the positive alkalinity lakes (1164).

If the water chemistry of these lakes improves in response to emission controls (Shaw et al. 1992) we expect to see an increase in the number of genera in the littoral benthic communities and a decline in the total number of chironomids. These features will be examined in subsequent reports as time-trend data are collected.

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Table 1. Physical characteristics and location of the 8 low alkalinity lakes.

LAKE	DATE	LAT.	LONG.	COUNTY	TOWNSHIP	MAP	AREA (ha)	WATERSHED[1]	ELEVATION (m)
CLAYTON	11 OCT 88	45 21	78 45	HALIBURTON	LIVINGSTONE	31E7	10.0	2EB12	427
CLYDE	24 OCT 88	45 18	78 16	HALIBURTON	CLYDE	31E8	13.5	2KD02	488
DOUGHNUT	27 OCT 88	45 28	78 45	MUSKOKA	LK. OF BAYS	31E7	11.1	2EB15	472
HUNTER	18 OCT 88	45 27	79 28	PARRY SOUND	McMURRICH	31E6	8.1	2EB21	335
PINE	31 OCT 88	45 41	79 03	NIPISSING	BUTT	31E11	24.2	2EA22	442
PIPIO	24 OCT 88	45 24	78 30	HALIBURTON	LAWRENCE	31E7	6.9	2EB12	472
SUGARBUSH	31 OCT 88	45 45	79 07	NIPISSING	BUTT	31E11,14	53.6	2EA21	457
TONAKELA	19 OCT 88	45 32	78 47	NIPISSING	PECK	31E10	10.5	2EB15	500

1. Cox, E.T. 1978. Counts and measurements of Ontario lakes by watershed unit.

Table 2. Mid lake chemistry for the 8 lakes (blanks indicate missing data).

PARAMETER	CLAYTON	CLYDE	DOUGHNUT	HUNTER	PINE	PIPIO	SUGARBUSH	TONAKELA
ALKT (TFE) ueq.L^{-1}	38.6		27.6	26.8	30.2	16.2	34.2	17.0
ALKTI(GRAN)ueq.L^{-1}	-7.59	-31.9	-7.4	-6.6	-3.2	-12.2	-1.0	-16.2
AL ug.L^{-1}	27	98	67	34	33	161	31	162
CA mg.L^{-1}	2.3	2.75	1.85	1.45	1.75	2.15	1.75	1.3
CL mg.L	0.4	0	0.3	0.3	0.4	0.7	0.4	0.2
COND25 uS.cm^{-1}	27.2	40.6	24.8	19	21.3	30.5	20.8	22.2
DIC mg.L^{-1}		0.25	0.34	0.26	0.47	0.44	0.37	0.37
DOC mg.L^{-1}	1.7	7.7	2.1	2.2	2.5	8.7	2.4	3.8
FE ug.L^{-1}	110	59	85	140	87	740	83	49
F mg.L^{-1}	37.6	54.2	40.2	20.9	38.7	60.9	46.2	47.4
K mg.L^{-1}	0.35	0.47	0.45	0.43	0.43	0.49	0.41	0.15
MG mg.L^{-1}	0.49	0.74	0.49	0.28	0.44	0.68	0.44	0.34
MN ug.L^{-1}	100	42	46	49	25	84	41	54
NA mg.L^{-1}	0.6	0.62	0.58	0.36	0.53	0.82	0.57	0.57
NH4 ug.L^{-1}	104	9	14	40	19	25	16	8
NO3 ug.L^{-1}	70	3	25	47	4	30	26	16
TKN ug.L^{-1}	250	310	190	380	250	570	190	180
pH	5.73	4.44	5.12	5.13	5.36	4.75	5.54	4.78
SI mg.L^{-1}	0.14	0.38	0.18	0.2	0.2	0.96	0.36	0.8
SO4 mg.L^{-1}	8.55	10.8	7.7	5.3	6.5	8.25	6.2	6.45
TOTAL ug.L^{-1} PHOSPHORUS	3.8	7.7	13.2	21	7.5	19.5	5	13.9

Table 3. Taxonomic richness, abundance, diversity and eveness data for the littoral benthic invertebrate collections.

LAKE	TOTAL # OF INDIVIDUALS	TOTAL # OF SPECIES	TOTAL # OF GENERA	H'	J'
CLAYTON	2467	67	55	1.154	0.663
CLYDE	2987	59	47	1.178	0.704
DOUGHNUT	2468	74	62	1.304	0.728
HUNTER	14250	59	50	0.921	0.542
PINE	5009	89	68	1.271	0.694
PIPIO	5130	87	62	1.240	0.692
SUGARBUSH	4982	89	66	1.068	0.587
TONAKELA	4304	78	59	1.213	0.685
MEAN	5286	75	58.6	1.168	0.662
RANGE	2467 - 14250	59 - 89	47 - 68	0.921 - 1.304	0.542 - 0.728

Table 4. Summary of the number of individuals collected in each lake (using 2 letter lake codes) at the order or sub-family taxonomic level.

TAXONOMIC NAME	CY	CE	DT	HT	PE	PO	SG	TA
NEMATODA	1	0	1	6	0	0	0	1
OLIGOCHAETA	14	16	32	6	39	4	6	0
HIRUDINEA	2	0	3	0	12	2	4	0
AMPHIPODA	102	136	85	3	421	1358	108	144
DECAPODA	2	0	0	0	1	0	0	0
HYDRACARINA	0	0	0	2	1	0	0	7
EPHEMEROPTERA	134	23	69	567	1299	472	1500	45
ODONATA	57	265	95	936	68	360	136	845
HEMIPTERA	50	92	49	8	7	112	207	12
MEGALOPTERA	0	3	0	0	93	0	1	1
TRICHOPTERA	19	132	68	84	118	284	273	228
LEPIDOPTERA	1	0	0	5	0	3	1	1
COLEOPTERA	3	4	37	0	4	141	71	14
DIPTERA TOTAL	2078	2319	2009	12536	3020	2380	2660	2946
DIPTERA:Ceratopogonidae	242	133	235	247	439	158	58	186
DIPTERA:Chironomidae	1834	2175	1764	12289	2571	2212	2595	2743
Subfam.-Tanypodinae	236	635	245	1370	340	354	141	368
Subfam.-Orthocladiinae	16	12	59	2558	475	5	217	276
Subfam.-Chironominae	1582	1059	1460	8361	1756	19	2238	2099
Tribe-Chironomini	1349	1045	1346	8333	1433	1113	2075	1395
Tribe-Tanytarsini	233	13	114	28	323	163	162	704
DIPTERA:Tabanidae	0	5	8	0	3	6	2	1
DIPTERA:Tipulidae	0	1	0	0	0	0	0	2
DIPTERA:Culicidae	0	0	0	0	0	1	0	0
DIPTERA:Chaoboridae	2	5	1	0	0	0	0	14
DIPTERA:Misc.	0	0	1	0	7	3	5	0
GASTROPODA	1	0	0	0	0	0	0	0
PELECYPODA	0	0	20	4	19	13	15	56
TOTAL INDIVIDUALS	2467	2987	2468	14250	5009	5130	4982	4304

LAKES: CY=CLAYTON, CE=CLYDE, DT=DOUGHNUT, HT=HUNTER

PE=PINE, PO=PIPIO, SG=SUGARBUSH, TA=TONAKELA

Table 5. Summary of the number of species collected in each lake at the order or sub-family taxonomic level.

TAXONOMIC NAME	CY	CE	DT	HT	PE	PO	SG	TA
NEMATODA	1	0	1	1	0	0	0	1
OLIGOCHAETA	4	1	3	3	3	2	3	2
HIRUDINEA	1	0	1	0	3	1	2	0
AMPHIPODA	1	1	2	2	2	1	1	1
DECAPODA	1	0	0	0	1	0	0	0
HYDRACARINA	0	0	0	1	1	0	0	1
EPHEMEROPTERA	3	1	3	3	4	2	2	2
ODONATA	5	6	5	8	8	11	9	6
HEMIPTERA	3	5	2	3	3	10	5	3
MEGALOPTERA	2	0	0	1	0	1	1	12
TRICHOPTERA	5	13	9	11	15	10	13	1
LEPIDOPTERA	1	0	0	1	0	2	1	4
COLEOPTERA	1	2	5	0	1	10	6	0
DIPTERA TOTAL	38	30	42	24	46	36	44	44
DIPTERA:Ceratopogonidae	8	5	6	5	6	5	5	8
DIPTERA:Chironomidae	29	22	33	19	36	28	34	32
Subfam.-Tanypodinae	4	4	5	3	8	4	6	10
Subfam.-Orthocladiinae	6	3	5	4	8	5	9	4
Subfam.-Chironominae	19	15	23	12	20	19	19	18
Tribe-Chironomini	15	13	20	11	16	17	16	17
Tribe-Tanytarsini	4	2	3	1	4	2	3	1
DIPTERA:Tabanidae	0	1	1	0	3	1	2	0
DIPTERA:Tipulidae	0	1	0	0	0	0	0	0
DIPTERA:Culicidae	0	0	0	0	0	1	0	1
DIPTERA:Chaoboridae	1	1	1	0	0	0	0	0
DIPTERA:Misc.	0	0	1	0	1	1	3	2
GASTROPODA	1	0	0	0	0	0	0	1
PELECYPODA	0	0	1	1	2	1	2	1
TOTAL SPECIES	67	59	74	59	89	87	89	78

LAKES: CY=CLAYTON, CE=CLYDE, DT=DOUGHNUT, HT=HUNTER

PE=PINE, PO=PIPIO, SG=SUGARBUSH, TA=TONAKELA

Table 6. Listing of the dominant benthic taxa ranked by number of individuals and by number of species.

LAKE	DOMINANT TAXA BY COUNT		DOMINANT TAXA BY NUMBER OF SPECIES	
CLAYTON	DIPTERA	2078	DIPTERA	38
	EPHEMEROPTERA	134	ODONATA	5
	AMPHIPODA	102	TRICHOPTERA	5
CLYDE	DIPTERA	2319	DIPTERA	30
	ODONATA	265	TRICHOPTERA	13
	AMPHIPODA	136	ODONATA	6
DOUGHNUT	DIPTERA	2009	DIPTERA	42
	ODONATA	95	TRICHOPTERA	9
	AMPHIPODA	85	ODONATA	5
HUNTER	DIPTERA	12536	DIPTERA	24
	ODONATA	936	TRICHOPTERA	11
	EPHEMEROPTERA	567	ODONATA	8
PINE	DIPTERA	3020	DIPTERA	46
	EPHEMEROPTERA	1299	TRICHOPTERA	15
	AMPHIPODA	421	ODONATA	8
PIPIO	DIPTERA	2380	DIPTERA	36
	AMPHIPODA	1358	ODONATA	11
	EPHEMEROPTERA	472	HEMIPTERA	10
SUGARBUSH	DIPTERA	2660	DIPTERA	44
	EPHEMEROPTERA	1500	TRICHOPTERA	13
	TRICHOPTERA	273	ODONATA	9
TONAKELA	DIPTERA	2946	DIPTERA	44
	ODONATA	845	TRICHOPTERA	12
	TRICHOPTERA	228	ODONATA	6

Table 7. The diversity-evenness data for the 8 lakes with the corresponding pair-wise matrix of between lake comparisons using H'. Values above the diagonal are t-values and their associated probabilities are below the diagonal.

LAKE NAME	Diversity H'	Evenness J'	LAKE CODE							
			CY	CE	DT	HT	PE	PO	SG	TA
CLAYTON	1.1539	0.6630	------	1.296	3.149	4.381	2.967	2.514	2.426	2.080
CLYDE	1.1775	0.7042	0.236	------	3.055	5.038	2.856	2.298	2.904	1.729
DOUGHNUT	1.3042	0.7276	0.016	0.018	------	5.746	1.612	2.225	4.078	2.636
HUNTER	0.9207	0.5419	0.003	0.002	0.001	------	6.217	5.817	3.658	5.535
PINE	1.2710	0.6936	0.021	0.024	0.151	0.000	------	1.701	4.078	2.303
PIPIO	1.2396	0.6916	0.040	0.055	0.061	0.001	0.133	------	3.709	1.539
SUGARBUSH	1.0676	0.5868	0.046	0.023	0.005	0.008	0.005	0.008	------	3.397
TONAKELA	1.2129	0.6849	0.076	0.127	0.034	0.001	0.055	0.168	0.011	------

Table 8. Physical characteristics and location of the 12 low to moderate alkalinity lakes.

NAME	CODE	SAMPLE DATE	LAT.	LONG.	COUNTY OR DISTRICT	TOWNSHIP	MAP[1] CODES	AREA (ha)	WATERSHED[2] (m)	ELEVATION
BLUE CHALK	BC	02 NOV 88	45 12	78 56	MUSKOKA	RIDOUT	31E2	52.4	2EC15	336
CLEAR	CL	26 OCT 88	45 11	78 43	HALIBURTON	SHERBORNE	31E2	88.4	2HF8	369
CRADLE	CR	26 OCT 88	45 28	78 35	HALIBURTON	LAWERENCE	31E7	17.9	2KD18	472.4
CROSSON	CN	17 OCT 88	45 05	79 02	MUSKOKA	OAKLEY	31E3	56.7	2EC15	312
DELANO	DO	26 OCT 88	45 31	78 36	NIPISSING	CANISBAY	31E10	23.9	2KD1	442
HAMER	HR	20 OCT 88	45 14	79 48	PARRY SOUND	HUMPHREY	31E4	35.2	2EB5	221
HARP	HP	14 OCT 88	45 23	79 07	MUSKOKA	CHAFFEY	31E6	71.4	2EB13	327
PINCHER	PN	27 OCT 88	45 34	78 51	NIPISSING	McCRANEY	31E10	42.1	2EB13	510.1
PLASTIC	PC	12 OCT 88	45 11	78 50	HALIBURTON	SHERBORNE	31E2	32.1	2HF10	379
SKIDWAY	SK	20 OCT 88	45 12	79 52	PARRY SOUND	CONGER	31E4	18.5	2EB2	221
WESTWARD	WD	19 OCT 88	45 29	78 47	NIPISSING	PECK	31E4	63.3	2EB11	429
YOUNG	YG	20 OCT 88	45 13	79 33	MUSKOKA	WATT	31E4	105.9	2EB7	251.5

1- Topographic map number
2- Terrestrial watershed code from Cox 1978.

Table 9. Listing of the taxa found only in one of the 10 negative alkalinity lakes (Genera underlined with Italics were found only among these 10 lakes)

TAXONOMIC NAME	PN	SK	CY	CE	DT	HT	PE	PO	SG	TA
OLIGOCHAETA										
Ilyodrilus templetoni		1								
Nais simplex								1		
Stylaria lacustris	1									
HIRUDINEA										
Desserobdella picta							1			
ISOPODA										
Asellus forbesi		115								
HYDRACARINA										
Arrenurus (A.) auricularis	1									
Arrenurus (Mega.) bergei					1					
Limnesia undulata		4								
Pseudohydryphantes orbicularis										
Unionicola crassipes laurentiana						1				
EPHEMEROPTERA										
Stenacron interpunctatum	2									
Stenonema (s.str.) femoratum					1					
ODONATA										
Basiaeschna janata		2								
Celithemis eponica	2									
Enallagma cyathigerum	5									
Enallagma exsulans		1								
Enallagma vesperum		35								
Hagenius brevistylus	4									
Lestes vigilax		2								
Libellula quadrimaculata			1							
Somatochlora williamsoni						2				
HEMIPTERA										
Hesperocorixa atopodonta							1			
Hesperocorixa kennicotti	13									
Hesperocorixa michiganensis	8									
Ranatra fusca		1								
Sigara (Arcto.) decoratella							3			
Sigara (Phaeo.) compressoidea						1				
Sigara (Phaeo.) mackinacensis				4						
Sigara (Vermi.) mullettensis					1					
TRICHOPTERA										
Banksiola dossuaria										1
Lype diversa									1	
Oecetis cinerascens		3								
Oecetis persimilis		2								
Orthotrichia sp.		1								
Phryganea sp.		1								
Triaenodes sp.2		3								
LEPIDOPTERA										
Acentria sp.		4								
Acentria sp.3								2		
Crampus sp.2										1

Table 9 cont"d. Listing of the taxa found only in one of the 10 negative alkalinity lakes (Genera underlined with Italics were found only among these 10 lakes)

TAXONOMIC NAME	PN	SK	CY	CE	DT	HT	PE	PO	SG	TA
COLEOPTERA										
Agabus anthracinus										1
Dineutus horni		2								
Graphoderus liberus										9
Gyrinus aeratus									2	
Gyrinus ventralis?		1								
Haliplus pantherinus								1		
Laccophilus maculasus							5			
Stenelmis crenata		2								
DIPTERA										
DIPTERA:Ceratopogonidae										
Alluaudomyia sp.										1
Bezzia sp.8										2
Monohelea sp.2	1									
DIPTERA:Chironomidae										
Subfam.-Tanypodinae										
Ablabesmyia (s.str.) aspera					9					
Ablabesmyia (Karelia) peleensis								4.2		
Labrundinia neopilosella	2									
Labrundinia sp.1										1
Larsia berneri										8.9
Larsia canadensis										4.2
Larsia indistincta		93								
Subfam.-Orthocladiinae										
Brillia parva		2								
Corynoneura sp.1		10								
Cricotopus (Iso.) sp. laricomalis gr.					1					
Cricotopus (s.str.) sp. bicinctus gr.	4									
Heterotrissocladius changi					10					
Limnophyes sp.									6	
Parametriocnemus lundbecki							4			
Psectrocladius (s.str.) sordidellus	117									
Pseudosmittia sp.2									1	
Subfam.-Chironominae										
Tribe-Chironomini										
Glyptotendipes sp. gr."B"	1									
Kiefferulus dux								1		
Parachironomus abortivus	1									
Paratendipes albimanus		2								
Polypedilum (s.str.) fallax gr.	1									
Pseudochironomus sp. 1					472					
Tribe-Tanytarsini										
Parapsectra sp.									1	
DIPTERA:Tabanidae										
Tabanus marginalis		1								
DIPTERA:Tipulidae										
Pedicia sp.		3								
Tipulidae gen. indet. sp.1								1		
DIPTERA:Culicidae								1		
Mansonia perturbans								1		
DIPTERA:Chaoboridae										
Chaoborus (s.str.) flavicans							1			
DIPTERA:Misc.										
Phoridae									1	

Table 10. Listing of the taxa found only in one of the 10 positive alkalinity lakes (Genera underlined with Italics were found only among these 10 lakes)

TAXONOMIC NAME	BC	CL	CR	CN	DO	HR	HP	PC	WD	YG
OLIGOCHAETA										
Nais simplex						1				
HIRUDINEA										
Desserobdella picta						1				
Glossiphonia complenata									1	
Placobdella ornata									1	
Placobdella papillifera							1			
AMPHIPODA										
Crangonyx gracilis	3									
DECAPODA										1
Cambarus bartoni			2							
Orconectes propinquus										1
Orconectes virilis	1									
HYDRACARINA										
Arrenurus (A.) auricularis							1			
Arrenurus (Mega.) apetiolatus				5						
Arrenurus (Mega.) bergei					1					
Arrenurus (Mega.) elevatus									1	
Arrenurus (Mega.) megalurus					1					
Limnochares americana						4				
Pseudohydryphantes orbicularis				2						
Unionicola crassipes laurentiana				25						
EPHEMEROPTERA										
Cleon rubropictum										1
Siphloplecton basale							1			
ODONATA										
Argia violaceo						9				
Chromagrion conditum								4		
Lestes vigilax						6				
Leucorrhinia frigida						30				
PLECOPTERA										
Nemoura trispinosa										1
Soyedina sp.									2	
HEMIPTERA										
Ranatra fusca			1							
Sigara (Arcto.) penniensis		2								
Sigara (Phaeo.) macropala										
Sigara (Phaeo.) mackinacensis							2			
Sigara (Pileo.) douglasensis					1					
MEGALOPTERA										
Chauliodes sp.				1						
TRICHOPTERA										
Banksiola smithi	1									
Limnephilidae	1									
Nemotaulius hostilis						1				
Oecetis persimilis	2									
Oecetis cinerascens					1					
LEPIDOPTERA										
Eoparargyractis sp.	2									

Table 10. Listing of the taxa found only in one of the 10 positive alkalinity lakes (Genera underlined with Italics were found only among these 10 lakes)

TAXONOMIC NAME	BC	CL	CR	CN	DO	HR	HP	PC	WD	YG
COLEOPTERA										
Gyrinus frosti					1					
Haliplus pantherinus										1
DIPTERA										
DIPTERA:Ceratopogonidae										
Bezzia sp.6										3
Bezzia sp.7	1									
Culicoides (O.) stellifer								4		
Forcipomyia sp.									1	
Palpomyia sp.1 tibialis gr.		1								
DIPTERA:Chironomidae										
Subfam.-Tanypodinae										
Labrundinia sp.1	1									
Larsia indistincta								3		
Natarsia baltimoreus				1						
Subfam.-Diamesinae										3
Potthastia sp.1 longimana gr.								3		
Subfam.-Orthocladiinae										
Cricotopus (Iso.) sp.2 sylvestris gr.			1							
Epoicocladius flavens										1
Epoicocladius sp. 1	1									
Nanocladius (s.str.) nr. minimus				2						
Limnophyes sp.	2									
Parakiefferiella sp.1 (ELA)		1								
Psectrocladius (Meso.) sp.		1								
Zalutschia sp.1	11									
Subfam.-Chironominae										
Tribe-Chironomini										
Dicrotendipes nervosus								1		
Omisus ?caledonicus						1				
Parachironomus abortivus				1						
Polypedilum (Pentapedilum) tritum					4					
Polypedilum (s.lat.) sp.2A	1									
Polypedilum (s.str.) scalaenum	9									3
Polypedilum (s.str.) trigonum				1						
Stictochironomus sp.2	5									
Xenochironomus xenolabis				1						
Tribe-Tanytarsini										
Tanytarsus sp. 'Pc-brush'							1			
Zavrelia sp.									1	
DIPTERA:Tabanidae										
Chrysops ?excitans										1
Chrysops sp.						1				
DIPTERA:Tipulidae										
Hexatoma sp.								1		
DIPTERA:Misc.										
Empididae: other genera								1		
GASTROPODA										
Campeloma decisum										4
Gyraulus parvus	1									
Physella (s.str.) gyrina									3	
PELECYPODA										
Musculium securis							17			

Table 11. Listing of the taxa common to all negative and/or all positive alkalinity lakes.

Negative Alkalinity SPECIES	Positive Alkalinity SPECIES
OLIGOCHAETA	**OLIGOCHAETA**
	Enchytraeidae
Lumbriculus variegatus	*Lumbriculus variegatus*
AMPHIPODA	**AMPHIPODA**
Crangonyx laurentianus	
	Hyalella azteca
EPHEMEROPTERA	**EPHEMEROPTERA**
	Eurylophella temporalis
Leptophlebia cupida	*Leptophlebia cupida*
ODONATA	**ODONATA**
	Gomphus (s. str.) exilis
TRICHOPTERA	**TRICHOPTERA**
Oecetis sp.1 DOR inconspicua cmplx	
	Pycnopsyche sp(p)
DIPTERA	**DIPTERA**
DIPTERA:Ceratopogonidae	**DIPTERA: CERATOPOGONIDAE**
Bezzia sp.1 DOR	
Bezzia sp.2/2A	
Bezzia sp.3 DOR	
DIPTERA:Chironomidae	**DIPTERA:Chironomidae**
Subfam.-Tanypodinae	**Subfam. Tanypodinae**
Ablabesmyia (s. str.) spp	*Ablabesmyia (s. str.) spp*
	Conchapelopia sp.1
Procladius (Holotanypus.) sp.	*Procladius (Holotanypus) sp.*
Subfam.-Orthocladiinae	**Subfam. Orthocladiinae**
Psectrocladius (s.str.) litofilus	*Psectrocladius (s.str.) litofilus*
	Psectrocladius (s.str.) simulans
Stackelbergina n.sp.1 * DOR	
Subfam.-Chironominae	**Subfam.-Chironominae**
Tribe-Chironomini	**Tribe-Chironomini**
Cryptochironomus conus	*Cryptochironomus conus*
	Dicrotendipes leucoscelis
Dicrotendipes modestus	*Dicrotendipes modestus*
	Dicrotendipes tritomus
Microtendipes pedellus	*Microtendipes pedellus*
Subfam.-Chironominae	**Subfam.-Chironominae**
Tribe-Chironomini	**Tribe-Chironomini**
Stenochironomus (s. str.) hilaris	*Stenochironomus (s. str.) hilaris*
Tribelos jucundum	*Tribelos jucundum*
Tribe-Tanytarsini	**Tribe-Tanytarsini**
	Cladotanytarsus sp.
Tanytarsus/Micropsectra spp.	*Tanytarsus/Micropsectra spp.*
	PELECYPODA
	Pisidium casertanum

Table 12. Listing of the taxa found only in either the ten negative or the ten positive alkalinity lakes
(taxa with underlined Italics were found only in one lake)

Negative Alkalinity	Positive Alkalinity	Negative Alkalinity	Positive Alkalinity
TURBELLARIA	**TURBELLARIA**	**DIPTERA**	**DIPTERA**
	Dugesia tigrina	**DIPTERA:Ceratopogonidae**	**DIPTERA:Ceratopogonidae**
		Alluaudomyia sp.	*Bezzia sp.7*
		Bezzia sp.8	*Culicoides (O.) stellifer*
OLIGOCHAETA	**OLIGOCHAETA**	*Monohelea sp.2*	Dasyhelea sp.2 (dark head)
Tubificidae -hairs	Slavania appendiculata		*Forcipomyia sp.*
	Uncinais uncinata		*Palpomyia sp.1 tibialis gr.*
			Palpomyia sp.2
			Probezzia sp.2
			Probezzia sp.3
			Stilobezzia sp.
HIRUDINEA	**HIRUDINEA**	**DIPTERA:Chironomidae**	**DIPTERA:Chironomidae**
	Gloiobdella elongata	**Subfam.-Podonominae**	**Subfam.-Podonominae**
	Glossiphonia complenata		Parochlus kiefferi
	Macrobdella decora		
	Placobdella ornata	**Subfam.-Tanypodinae**	**Subfam.-Tanypodinae**
	Placobdella papillifera	*Ablabesmyia (s.str.) aspera*	Djalmabatista pulcher
		Ablabesmyia (s.str.) mallochi	Thienemannimyia norena
ISOPODA	**ISOPODA**	Ablabesmyia (s.str.) monilis	
Asellus forbesi		Ablabesmyia (Karelia) illinoensis	
		Guttipelopia guttipennis	
		Larsia berneri	
		Subfam.-Diamesinae	**Subfam.-Diamesinae**
AMPHIPODA	**AMPHIPODA**		*Potthastia sp.1 longimana gr.*
	Crangonyx gracilis	**Subfam.-Prodiamesinae**	**Subfam.-Prodiamesinae**
			Monodiamesa nr. bathyphila
DECAPODA	**DECAPODA**	**Subfam.-Orthocladiinae**	**Subfam.-Orthocladiinae**
Cambaris (P) robustus	*Cambarus bartoni*	*Brillia parva*	Corynoneura nr. scutellata
	Orconectes propinquus	*Cricotopus (Iso.)sp. laricomalis gr.*	*Cricotopus (Iso.) Sp 2 sylvestris gr.*
	Orconectes virilis	*Cricotopus (s.str.) sp. bicinctus gr.*	*Epoicocladius flavens*
		Pseudorthocladius sp.	*Epoicocladius sp. 1*
HYDRACARINA	**HYDRACARINA**	Psectrocladius (Allops) pilosus	Heterotrissocladius hirtapex
	Arrenurus (Mega.) apetiolatus	*Psectrocladius (s.str.) sordidellus*	*Nanocladius (s.str.) nr. minimus*
	Arrenurus (Mega.) elevatus	*Pseudosmittia sp 2*	*Parakiefferiella sp.1 (ELA)*
	Arrenurus (Mega.) megalurus		Parakiefferiella sp.2 (ELA)
	Hydrodroma americanus		*Psectrocladius (Meso.) sp.*
	Pseudohydryphantes orbicularis		Pseudosmittia sp.1
			Xylotopus par
EPHEMEROPTERA	**EPHEMEROPTERA**	**Subfam.-Chironominae**	**Subfam.-Chironominae**
	Caenis punctata	**Tribe-Chironomini**	**Tribe-Chironomini**
	Cleon rubropictum	*Kiefferulus dux*	Demicryptochironomus (Irmakia) cuneatus
	Ephemera simulans	Phaenopsectra sp.	*Dicrotendipes nervosus*
	Eurylophella bartoni	*Polypedilum (s.str.) fallax gr.*	Polypedilum (Pentapedilum) sordens
	Hexagenia limbata	*Pseudochironomus sp.1*	*Polypedilum (s.str.) scalaenum*
	Siphloplecton basale	Pseudochironomus sp.3	Polypedilum (Tripodura) sp.1

Table 12. Cont'd Listing of the taxa found only in either the ten negative or the ten positive alkalinity lakes
(taxa with underlined Italics were found only in one lake)

Negative Alkalinity	Positive Alkalinity	Negative Alkalinity	Positive Alkalinity
ODONATA	**ODONATA**	**Subfam.-Chironominae**	**Subfam.-Chironominae**
Enallagma boreale	Aeshnna canadensis	**Tribe-Chironomini**	**Tribe-Chironomini**
Enallagma cyathigerum	*Argia violacea*		Stictochironomus spp.
Enallagma vesperum	Boyeria grafiana		*Stictochironomus sp.2*
Lestes disjunctus	Celithemis eponica		*Xenochironomus xenolabis*
Libellula quadrimaculata	Didymops transversa	**Tribe-Tanytarsini**	**Tribe-Tanytarsini**
	Dromogomphus spinosus	*Parapsectra sp.*	*Zavrelia sp.*
		DIPTERA:Tabanidae	**DIPTERA:Tabanidae**
		Tabanus marginalis	
PLECOPTERA	**PLECOPTERA**	**DIPTERA:Tipulidae**	**DIPTERA:Tipulidae**
	Isoperla marlynia	Dactylolabis sp.	Erioptera sp.
	Nemoura trispinosa	*Pedicia sp.*	Gonomyia sp.
	Soyedina sp.	*Tipulidae gen. indet. sp.1*	*Hexatoma sp.*
HEMIPTERA	**HEMIPTERA**	**DIPTERA:Culicidae**	**DIPTERA:Culicidae**
Belostoma flumineum	*Sigara (Pileo.) douglasensis*	*Mansonia perturbans*	
Buenoa macrotibialis			
Cenocorixa n.sp		**DIPTERA:Misc.**	**DIPTERA:Misc**
Hesperacorixa atopodonta		*Phoridae*	*Empididae: other genera*
Hesperocorixa kennicotti			
Hesperocorixa lobata		**DIPTERA:Chaoboridae**	**DIPTERA:Chaoboridae**
Hesperocorixa michiganensis		Chaoborus (Sayomia) punctipennis	Chaoborus (s.str.) americanus
Hesperocorixa vulgaris		*Chaoborus (s.str.) flavicans*	
Notonecta insulata			
Sigara (Arcto.) decoratella			
Sigara (Phaeo.) compressoidea			
Sigara (Phaeo.) macropala			
Sigara (Vermi.) deflecta			
Sigara (Vermi.) mullettensis			
TRICHOPTERA	**TRICHOPTERA**	**GASTROPODA**	**GASTROPODA**
Agrypnia improba	Agarodes cf. distinctus		Amnicola limosa
Banksiola dossuaria	Ceraclea alces		*Campeloma decisum*
Orthotrichia sp.	Hydroptila sp.1		*Gyraulus parvus*
Oxyethirma sp.4	Lepidostoma sp.		Helisoma anceps
Phryganea sp.	*Limnephilidae*		*Physella (s.str.) gyrina*
	Mystacides sepulchralis		Menetus (Micro.) dilatatus
	Nectopsyche sp.3 nr pavida		
	Oecetis cinerascens		
	Phylocentropus sp.		

Table 12. Cont'd Listing of the taxa found only in either the ten negative or the ten positive alkalinity lakes
(taxa with underlined Italics were found only in one lake)

Negative Alkalinity	Positive Alkalinity	Negative Alkalinity	Positive Alkalinity
LEPIDOPTERA	**LEPIDOPTERA**	**PELECYPODA**	**PELECYPODA**
Acentria sp.	*Eoparargyractis sp*		*Musculium securis*
Acentria sp.2			Pisidium adamsi
Acentria sp3.			Pisidium ferrugineum
Crampus sp 2			Pisidium subtruncatum
			Pisidium variabile
COLEOPTERA	**COLEOPTERA**		
Agabus anthracinus	Berosus sp.		
Agabus sp. ELA	Cyphon sp.		
Coptotomus longulus	Dubiraphia minima-vitatta		
Dineutus horni	Ectopria nervosa		
Gyrinus aeratus	*Gyrinus frosti*		
Gyrinus affinis	Macronychus glabratus		
Gyrinus pectoralis			
Gyrinus sayi (=lugens)			
Gyrinus ventralis			
Graphoderus liberus			
Laccophilus maculosus			
Tropisternus mixtus			

Table 13. Correlation of lake alkalinity with the simple bethos metrics.

LAKE NAME	ABBREV.	ALKTI(GRAN) ueq.L^{-1}	GENERA	INDIV.	H'	J'
CLYDE	CE	-31.9	47	3000	1.1775	0.7042
TONAKELA	TA	-16.2	59	4022	1.2129	0.6849
PIPIO	PO	-12.2	62	5131	1.2396	0.6916
CLAYTON	CY	-7.6	55	2468	1.1539	0.6630
DOUGHNUT	DT	-7.4	62	2466	1.3042	0.7276
HUNTER	HT	-6.6	50	14251	0.9207	0.5419
PINCHER	PN	-5.4	62	2819	1.2838	0.7163
PINE	PE	-3.2	68	5007	1.2710	0.6936
SKIDWAY	SK	-1.2	91	8896	1.3424	0.6852
SUGARBUSH	SG	-1.0	66	4984	1.0676	0.5868
CRADLE	CR	1.6	73	3190	1.0845	0.5820
CLEAR	CL	3.0	79	2851	1.2247	0.6454
PLASTIC	PC	9.8	77	3306	1.3898	0.7367
CROSSON	CN	14.1	81	4915	1.1730	0.6146
HAMER	HR	14.7	86	7923	0.9790	0.5061
WESTWARD	WD	42.8	91	3328	1.1991	0.6121
DELANO	DO	48.6	82	2189	1.1271	0.5889
HARP	HP	76.7	83	4333	1.0522	0.5483
BLUE CHALK	BC	90.0	86	3552	1.1917	0.6160
YOUNG	YG	98.0	87	3246	0.8844	0.4560
SUMMARY	MIN	-31.9	47.0	2189.0	0.8844	0.4560
	MAX	98.0	91.0	14251.0	1.3898	0.7367
	MEAN	15.3	72.4	4593.9	1.1640	0.6301
	MEDIAN	0.3	75.0	3440	1.1846	0.6307
	STDS	36.4	13.8	2862.2	0.1345	0.0781

Correlation matrix for the 10 lake negative alkalinity set.

	ALKTI	GENERA	INDIV.	H'	J'
ALKTI	1				
GENERA	0.6160	1			
INDIV.	0.2945	0.1294	1		
H'	0.0463	0.5826	-0.5523	1	
J'	-0.2908	0.1984	-0.7296	0.9105	1

Correlation matrix for the 10 lake positive alkalinity set.

ALKTI	1				
GENERA	0.6139	1			
INDIV.	-0.1866	0.2392	1		
H'	-0.4421	-0.3370	-0.3516	1	
J'	-0.4930	-0.4367	-0.3625	0.9941	1

Correlation for the combined 20 lake low to moderate alkalinity set

ALKTI	1				
GENERA	0.6997	1			
INDIV.	-0.1812	-0.0983	1		
H'	-0.3941	-0.0294	-0.3488	1	
J'	-0.6194	-0.4062	-0.3001	0.9237	1

Figure 1. Map illustrating the location of the study lakes in south central Ontario

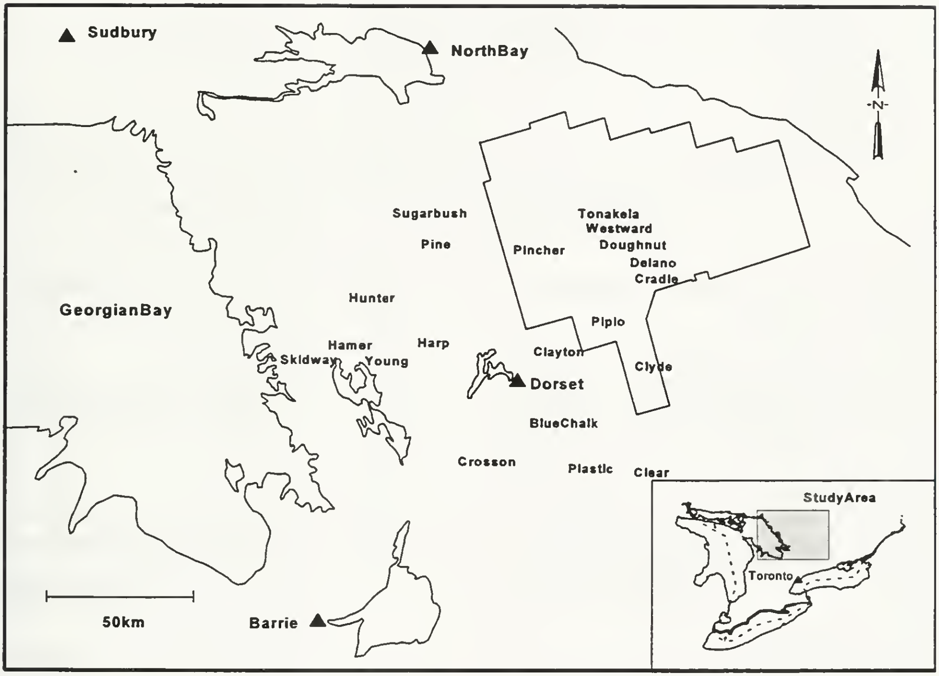


Figure 2 Z-score plot of the genus richness, abundance, diversity and evenness data from the 8 low alkalinity lakes sampled in the fall of 1988.

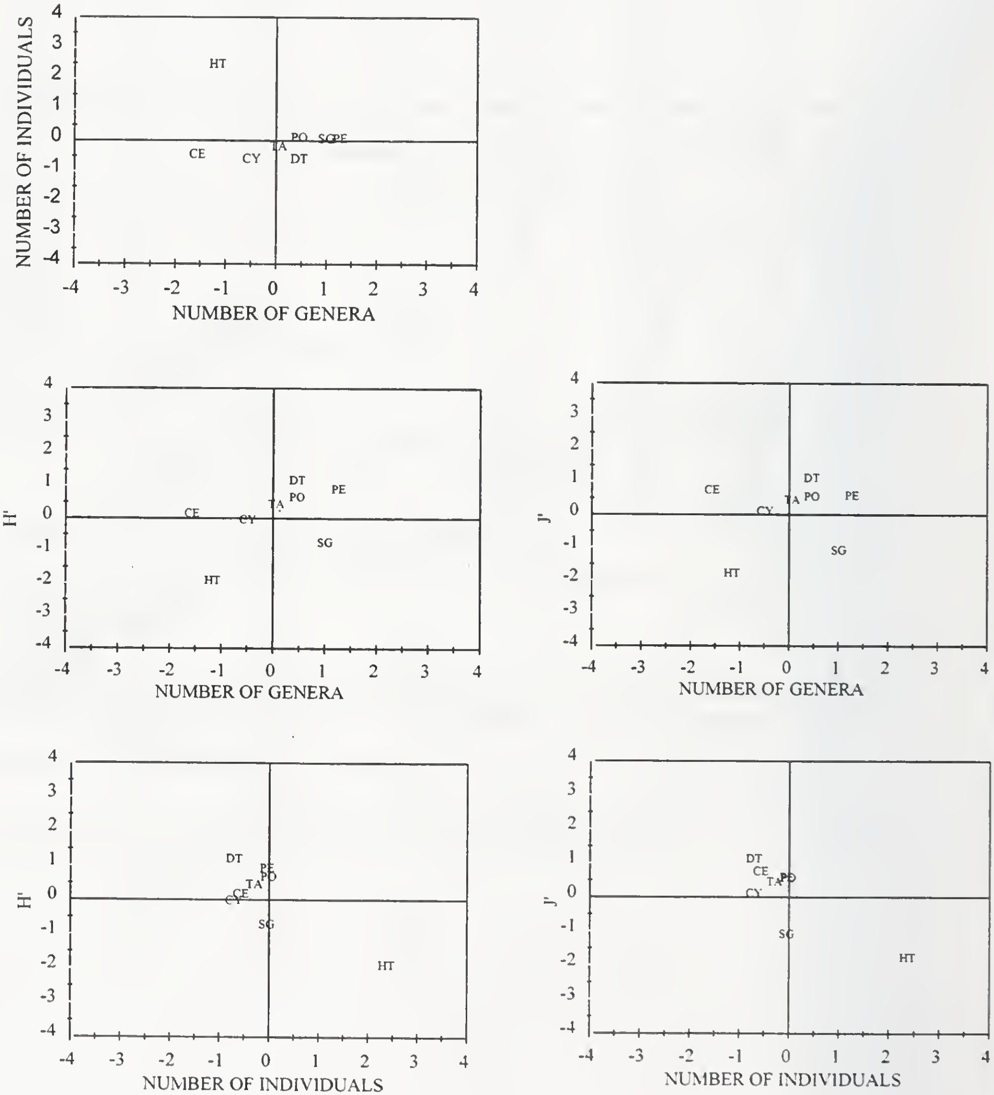
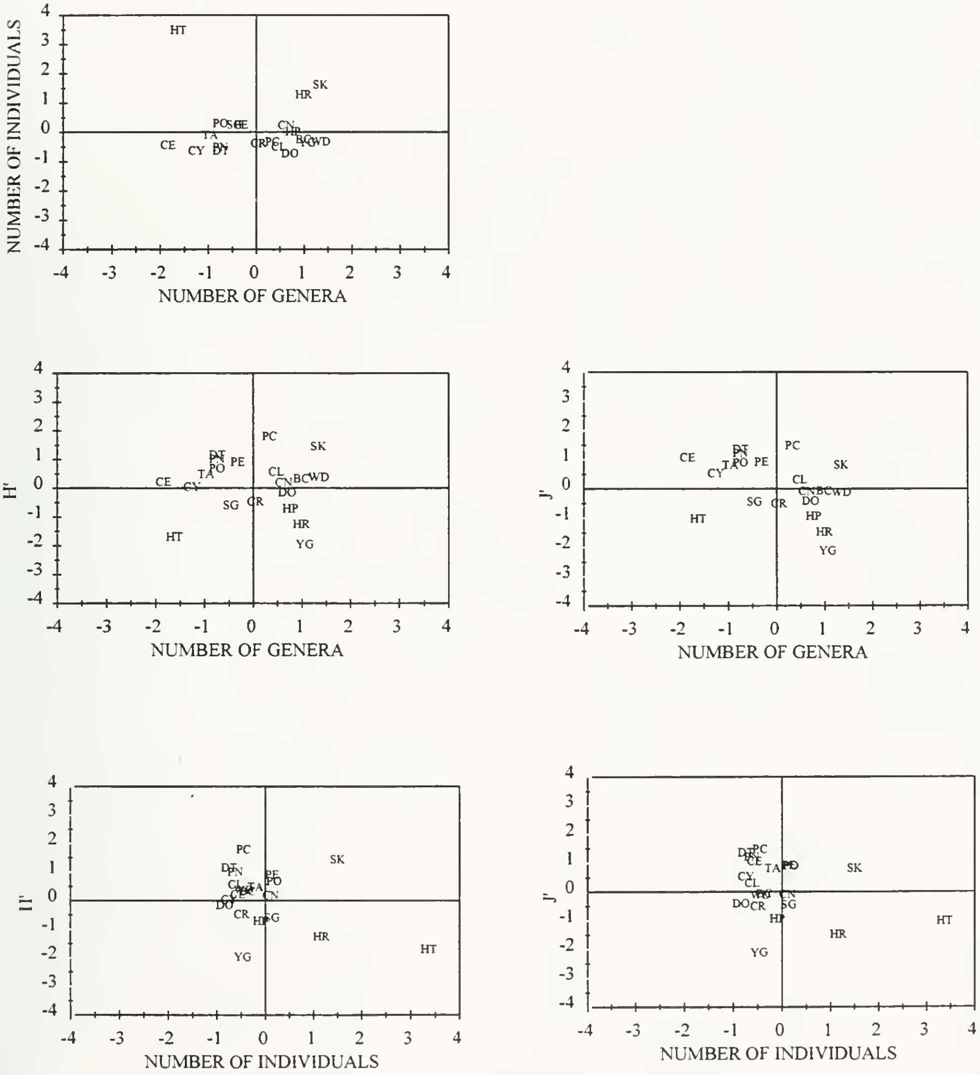
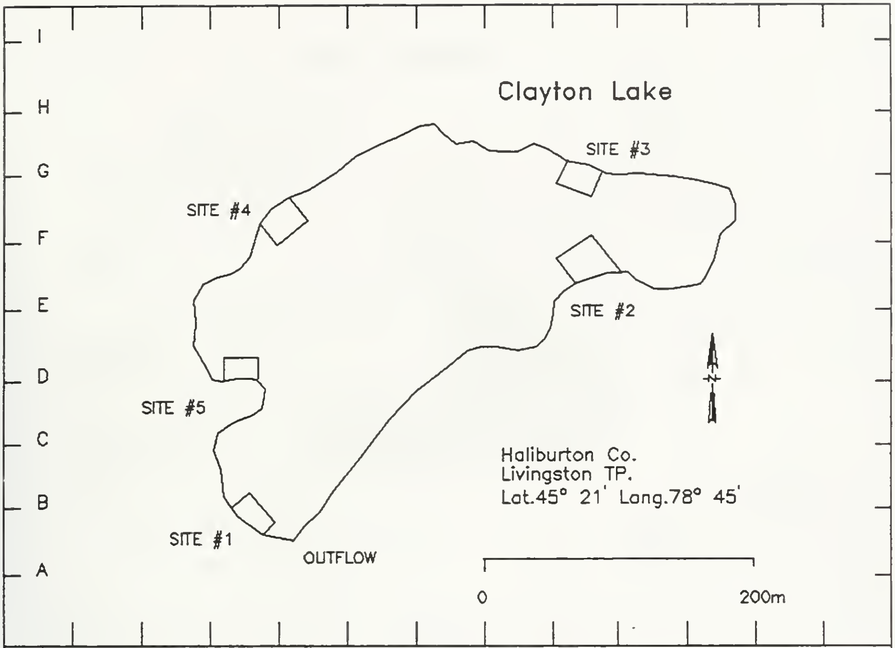


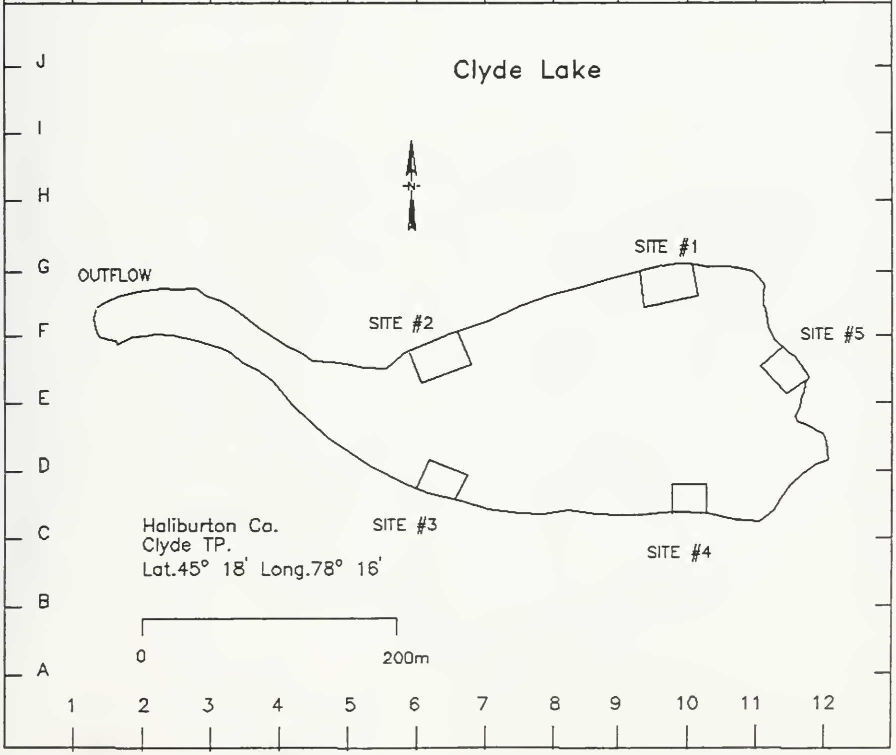
Figure 3. Z-score plot of the genus richness, abundance, diversity and evenness data from all 20 lakes sampled in the fall of 1988.

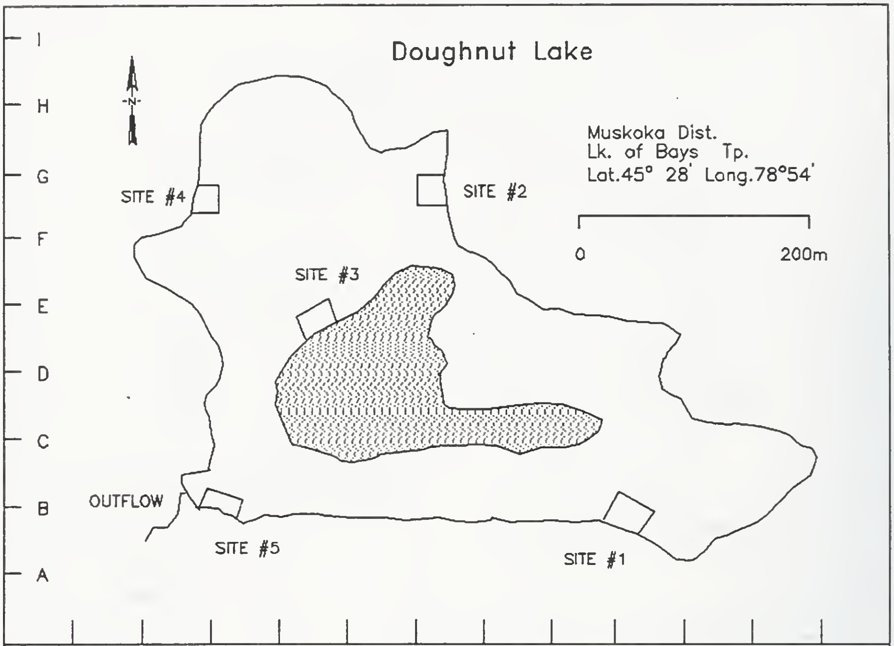


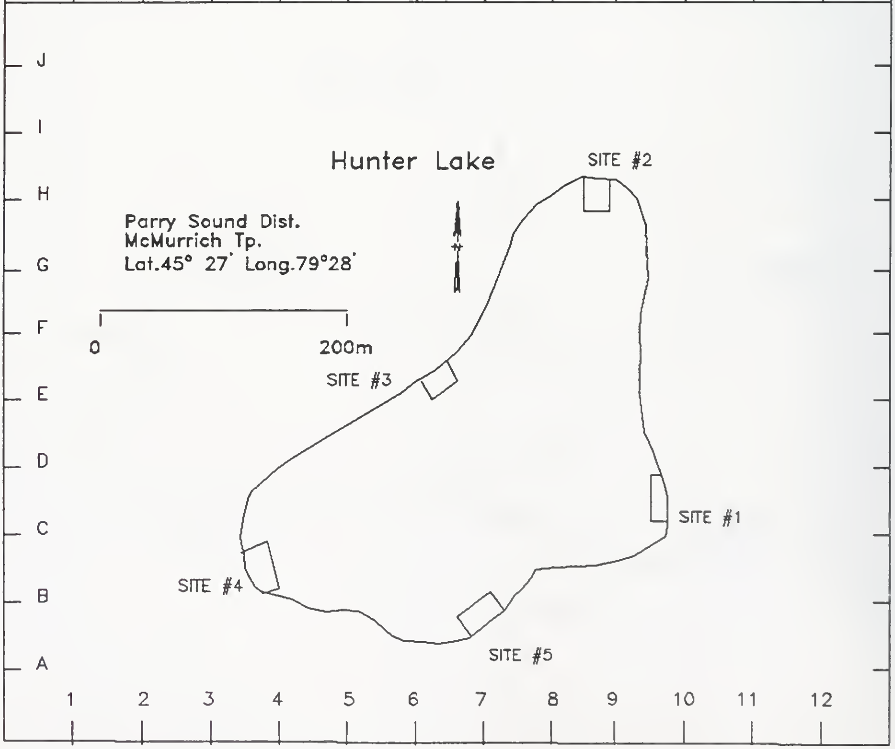
APPENDIX 1

Maps of the study lakes


Clayton Lake
I
H
G
F
E
D
C
B
A
SITE #3
SITE #4
SITE #2
SITE #5
SITE #1
OUTFLOW
N
Haliburton Co.
Livingston TP.
Lat.45° 21' Long.78° 45'
0
200m


Clyde Lake
J
I
H
G
F
E
D
C
B
A
N
OUTFLOW
SITE #1
SITE #2
SITE #5
SITE #3
SITE #4
Haliburton Co.
Clyde TP.
Lat.45° 18' Long.78° 16'
0
200m
1
2
3
4
5
6
7
8
9
10
11
12


Doughnut Lake
Muskoka Dist.
Lk. of Bays Tp.
Lat.45° 28' Long.78°54'
0
200m
N
SITE #1
SITE #2
SITE #3
SITE #4
SITE #5
OUTFLOW
A
B
C
D
E
F
G
H
I


Hunter Lake
Parry Sound Dist.
McMurrich Tp.
Lat.45° 27' Long.79°28'
0
200m
N
SITE #1
SITE #2
SITE #3
SITE #4
SITE #5
A
B
C
D
E
F
G
H
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J
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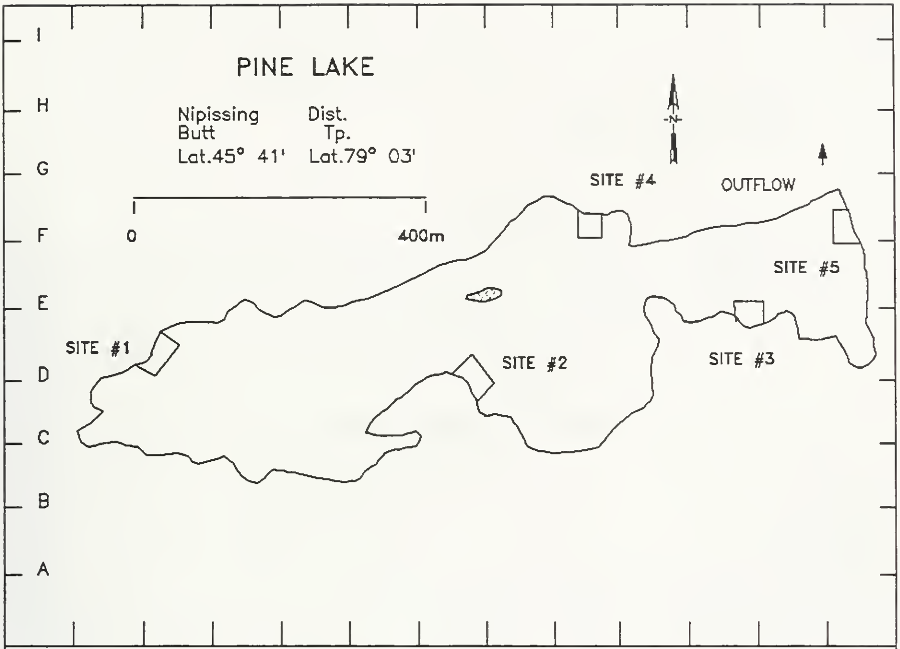
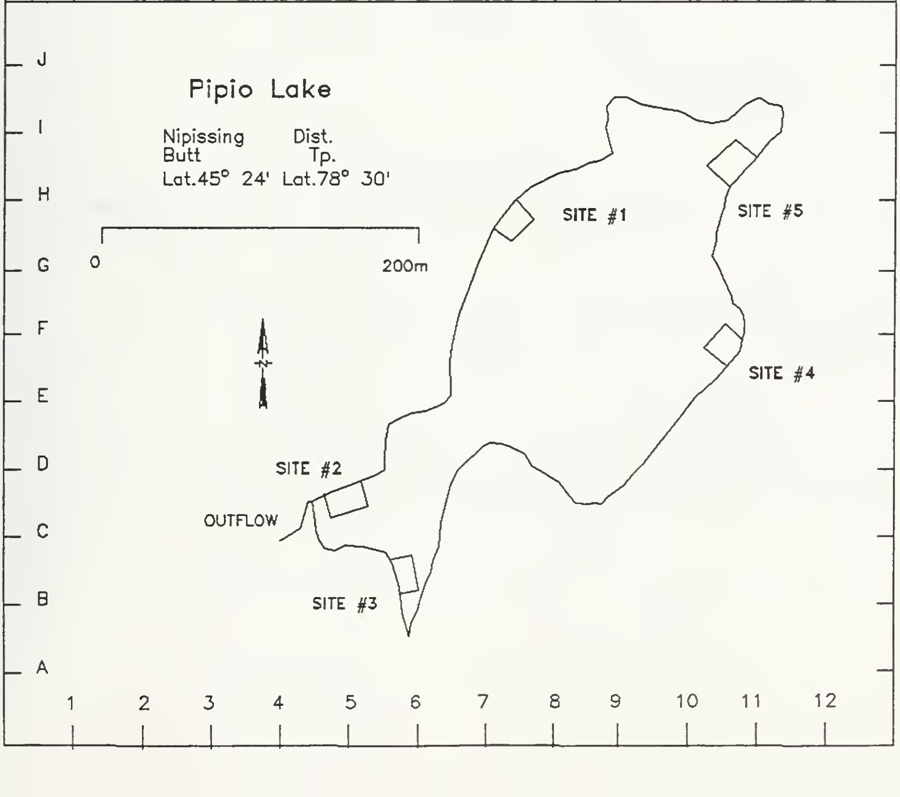
8
9
10
11
12


PINE LAKE
Nipissing Dist.
Butt Tp.
Lat.45° 41' Lat.79° 03'
0
400m
N
SITE #4
OUTFLOW
SITE #5
SITE #1
SITE #2
SITE #3
I
H
G
F
E
D
C
B
A


Pipio Lake
Nipissing Dist.
Butt Tp.
Lat.45° 24' Lat.78° 30'
0
200m
N
SITE #1
SITE #5
SITE #4
SITE #2
OUTFLOW
SITE #3
J
I
H
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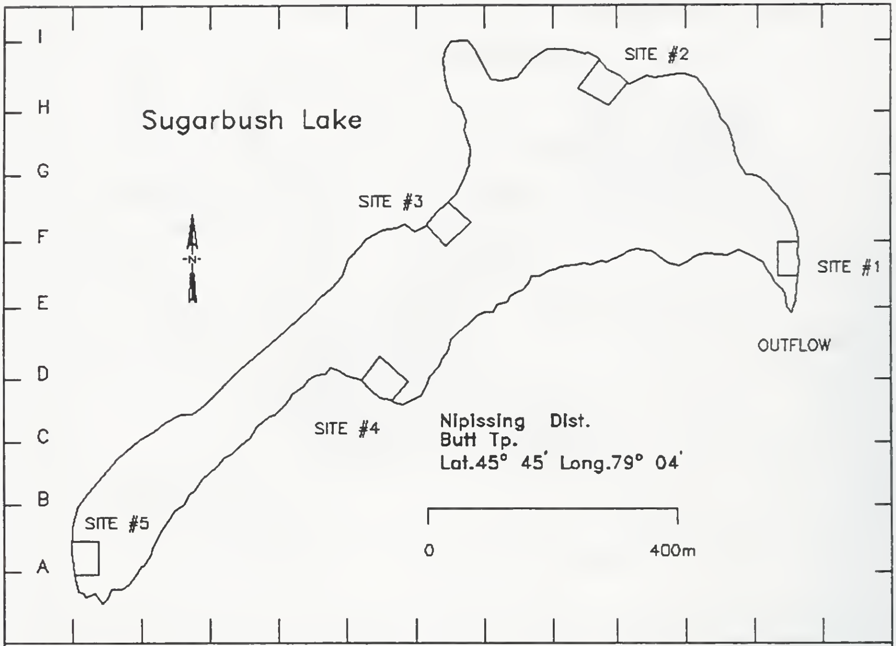
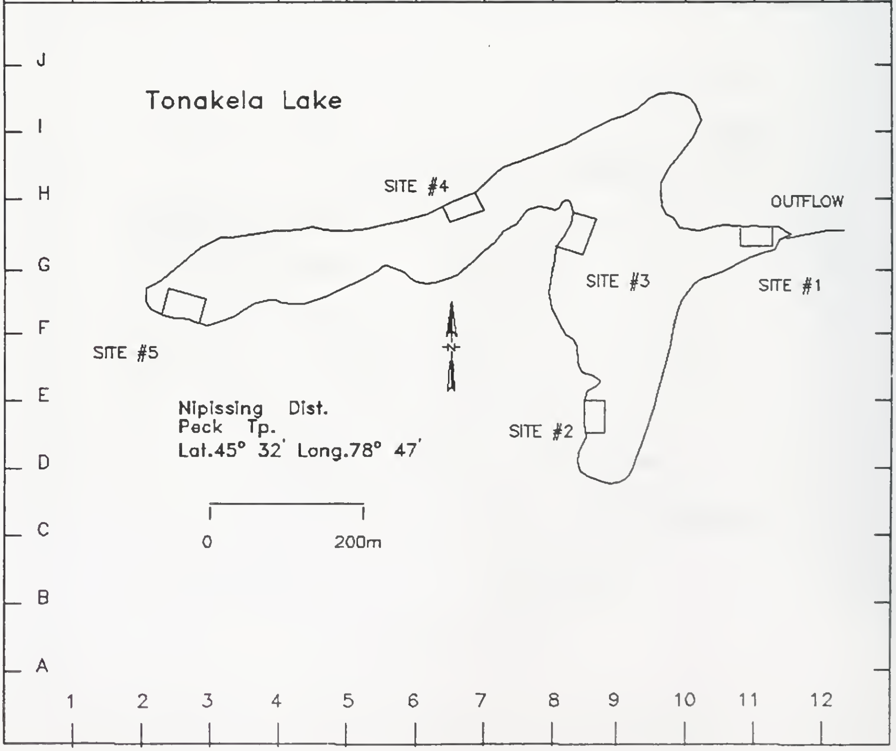

Sugarbush Lake
SITE #1
SITE #2
SITE #3
SITE #4
SITE #5
OUTFLOW
N
Nipissing Dist.
Butt Tp.
Lat.45° 45' Long.79° 04'
0
400m
A
B
C
D
E
F
G
H
I


Tonakela Lake
SITE #1
SITE #2
SITE #3
SITE #4
SITE #5
OUTFLOW
N
Nipissing Dist.
Peck Tp.
Lat.45° 32' Long.78° 47'
0
200m
A
B
C
D
E
F
G
H
I
J
1
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APPENDIX 2

Taxonomic list and associated database codes

Appendix 2: Taxonomic List and associated database Codes

MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
1	2026	COELENTERATA	HYDROZOA	HYDROIDA		HYDRIDAE			HYDRA		
100	2119	PLATYHELMINTHES	TURBELLARIA								
102	2123	PLATYHELMINTHES	TURBELLARIA	TRICLADIDA		PLANARIIDAE			DUGESIA		TIGRINA
200	2103	NEMATODA									
202	2106	NEMATODA		MONONCHIDA		MONONCHIDAE			ANATONCHUS		
203	2109	NEMATODA	ADENOPHOREA	DORYLAIMIDA	DORYLAIMINA	DORYLAIMIDAE			DORYLAIMUS		
204	2136	NEMATODA	ADENOPHOREA	ENOPLIDA	MERMITHOIDEA	MERMITHIDAE			DIVISPICULIMERIS		
206	2111	NEMATODA	ADENOPHOREA	ENOPLIDA	MERMITHOIDEA	MERMITHIDAE			HYDROMERMIS		
208	2112	NEMATODA	ADENOPHOREA	ENOPLIDA	MERMITHOIDEA	MERMITHIDAE			LIMNOMERMIS		
210	2108	NEMATODA	ADENOPHOREA	ENOPLIDA	MERMITHOIDEA	MERMITHIDAE			MERMITHIDAE		
212		NEMATODA	ADENOPHOREA	DORYLAIMIDA	DORYLAIMINA	DORYLAIMIDAE			PARACTINOLAIMUS		
300	263	ANNELIDA	OLIGOCHAETA								
302	237	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		NAIDIDAE			ARCTEONAIS		LOMONDI
303	278	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		TUBIFICIDAE			AULODRILUS		PIGUETI
304	224	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		ENCHYTRAEIDAE			CERNOSVITOVIELLA		
305	227	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		TUBIFICIDAE			ILYODRILUS		TEMPLETONI
306	273	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		TUBIFICIDAE			LIMNODRILUS		CLAPAREDEIANUS
308	277	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		TUBIFICIDAE			LIMNODRILUS		HOFFMEISTERI
310	223	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		TUBIFICIDAE			LIMNODRILUS		UDEKEMIANUS
312	270	ANNELIDA	OLIGOCHAETA	LUMBRICULIDA		LUMBRICULIDAE			LUMBRICULUS		VARIEGATUS
314	267	ANNELIDA	OLIGOCHAETA	LUMBRICULIDA		LUMBRICULIDAE			LUMBRICULUS		
315	230	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		NAIDIDAE			NAIS		COMMUNIS
316	259	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		NAIDIDAE			NAIS		PSEUDOBTUSA
317	258	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		NAIDIDAE			NAIS		SIMPLEX
318	235	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		NAIDIDAE			STYLARIA		LACUSTRIS
319	240	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		NAIDIDAE			SLAVINA		APPENDICULATA
320	268	ANNELIDA	OLIGOCHAETA	LUMBRICULIDA		LUMBRICULIDAE			STYLODRILUS		HERINGIANUS
322	239	ANNELIDA	OLIGOCHAETA	TUBIFICIDA		TUBIFICIDAE			TASSERKIDRILUS		HARMANI
324	2137	ANNELIDA	OLIGOCHAETA	TUBIFICIDA		TUBIFICIDAE			TUBIFICIDAE		
326	2138	ANNELIDA	OLIGOCHAETA	TUBIFICIDA		TUBIFICIDAE					
327	246	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		NAIDIDAE			UNCINAIS		UNCINATA
328	233	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		NAIDIDAE			VEJDOVSKYELLA		COMATA
329	256	ANNELIDA	OLIGOCHAETA	HAPLOTAXIDA		NAIDIDAE			NAIS		VARIABILIS
400	207	ANNELIDA	HIRUDINEA								
402	199	ANNELIDA	HIRUDINEA	PHARYNGOBDELLIDA		ERPOBDELLIDAE			ERPOBDELLA		PUNCTATA
404	214	ANNELIDA	HIRUDINEA			GLOSSIPHONIIDAE			GLOIOBDELLA		ELONGATA
405	195	ANNELIDA	HIRUDINEA			GLOSSIPHONIIDAE			GLOSSIPHONIA		COMPLANATA
406	211	ANNELIDA	HIRUDINEA	GNATHOBDELLIDA		HIRUDINIDAE			HAEMOPIS		MARMORATA
408	216	ANNELIDA	HIRUDINEA			GLOSSIPHONIIDAE			HELOBDELLA		STAGNALIS
409	209	ANNELIDA	HIRUDINEA	GNATHOBDELLIDA		HIRUDINIDAE			MACROBDELLA		DECORA
410	201	ANNELIDA	HIRUDINEA	PHARYNGOBDELLIDA		ERPOBDELLIDAE			NEPHELOPSIS		OBSCURA
412	190	ANNELIDA	HIRUDINEA			GLOSSIPHONIIDAE			PLACOBDELLA		
414	188	ANNELIDA	HIRUDINEA			GLOSSIPHONIIDAE			PLACOBDELLA		MULTILINEATA
416	191	ANNELIDA	HIRUDINEA			GLOSSIPHONIIDAE			PLACOBDELLA		ORNATA
		ANNELIDA	HIRUDINEA			GLOSSIPHONIIDAE			PLACOBDELLA		PAPILLIFERA
418	189	ANNELIDA	HIRUDINEA			GLOSSIPHONIIDAE			PLACOBDELLA		PICTA

Appendix 2: Taxonomic List and associated database Codes

MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
500	621	ARTHROPODA	CRUSTACEA	PERACARIDA	ISOPODA						
502	622	ARTHROPODA	CRUSTACEA	PERACARIDA	ISOPODA	ASELLIDAE			ASELLUS		FORBESI
600	338	ARTHROPODA	CRUSTACEA	PERACARIDA	AMPHIPODA						
602	342	ARTHROPODA	CRUSTACEA	PERACARIDA	AMPHIPODA	CRANGONYCTIDAE			CRANGONYX		GRACILIS
604	619	ARTHROPODA	CRUSTACEA	PERACARIDA	AMPHIPODA	CRANGONYCTIDAE			CRANGONYX		LAURENTIANUS
606	339	ARTHROPODA	CRUSTACEA	PERACARIDA	AMPHIPODA	TALITRIDAE			HYALELLA		AZTECA
608	337	ARTHROPODA	CRUSTACEA	PERACARIDA	AMPHIPODA	PONTOPOREIIDAE			DIPOREIA		HOYI
700	2139	ARTHROPODA	CRUSTACEA	DECAPODA							
701	616	ARTHROPODA	CRUSTACEA	EUCARIDA	DECAPODA	CAMBARIDAE	CAMBARINAE		CAMBARUS		BARTONI
702	329	ARTHROPODA	CRUSTACEA	EUCARIDA	DECAPODA	CAMBARIDAE	CAMBARINAE		CAMBARUS	PUNCTICAMBARUS	ROBUSTUS
704	612	ARTHROPODA	CRUSTACEA	EUCARIDA	DECAPODA	CAMBARIDAE	CAMBARINAE		ORCONECTES		PROPINQUIS
706	613	ARTHROPODA	CRUSTACEA	EUCARIDA	DECAPODA	CAMBARIDAE	CAMBARINAE		ORCONECTES		VIRILIS
800	279	ARTHROPODA	ARACHNOIDEA	ACARIFORMES							
802	661	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	ARRENURIDAE			ARRENURUS	ARRENURUS	AMERICANUS
804	281	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	ARRENURIDAE			ARRENURUS	ARRENURUS	AURICULARIS
806	282	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	ARRENURIDAE			ARRENURUS	MEGARRENURUS	APETIOLATUS
808	662	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	ARRENURIDAE			ARRENURUS	MEGARRENURUS	CARDIACUS
		ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	ARRENURIDAE			ARRENURUS	MEGARRENURUS	ELEVATUS
810	659	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	ARRENURIDAE			ARRENURUS	MEGARRENURUS	MEGALURUS
812	323	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	HYDRODROMIDAE			ATRACTIDES		
814	320	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	UNIONICOLIDAE			HUITFELDTIA		RECTIPES
816	645	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	HYDRODROMIDAE			HYDRODROMA		AMERICANUS
817	649	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	HYDRODROMIDAE			HYDRODROMA		DESPICIENS
818	296	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	HYDRODROMIDAE			HYGROBATES		LONGIPALPIS
820	308	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	HYGROBATIDAE			HYGROBATES		NEOCALLIGER
822	651	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	LEBERTIIDAE			LEBERTIA		DISTINCTA
824	653	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	LIMNESIIDAE			LIMNESIA		MACULATA
826	648	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	LIMNESIIDAE			LIMNESIA		UNDULATA
827	654	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	LIMNOCHARIDAE			LIMNOCARES		
828	306	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	HYDRYPHANTIDAE			PSEUDOHYDRYPHANTES		ORBICULARIS
830	655	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	UNIONICOLIDAE			UNIONICOLA	CRASSIPES	LAURENTIANA
832	317	ARTHROPODA	ARACHNOIDEA	ACARIFORMES	PROSTIGMATA	ARRENURIDAE			ARRENURUS	MEGARRENURUS	BIRGEI
834	2140	ARTHROPODA	ARACHNIDA	HYDRACARINA	ARRENURIDAE				ARRENURUS	MEGALURACARUS	ELEVATUS
900	416	ARTHROPODA	INSECTA	COLLEMBOLA							
902	430	ARTHROPODA	INSECTA	COLLEMBOLA	ARTHROPLEONA	ISOTOMIDAE			FOLSOMIA		
904	421	ARTHROPODA	INSECTA	COLLEMBOLA	ARTHROPLEONA	PODURIDAE			HYPOGASTRURA		
905	2141	ARTHROPODA	INSECTA	COLLEMBOLA	ARTHROPLEONA	PODURIDAE			HYPOGASTRURA		VIATICA
906	422	ARTHROPODA	INSECTA	COLLEMBOLA	ARTHROPLEONA	ONYCHIURIDAE			ISOTOMURUS	HYDROISOTOMA	
908	2142	ARTHROPODA	INSECTA	COLLEMBOLA	ARTHROPLEONA	ISOTOMIDAE			METISOTOMA		
1000	1186	ARTHROPODA	INSECTA	EPHEMEROPTERA							
1002	1228	ARTHROPODA	INSECTA	EPHEMEROPTERA		HEPTAGENIIDAE	ARTHROPLEINAE		ARTHROPLEA		BIPUNCTATA
1004	2143	ARTHROPODA	INSECTA	EPHEMEROPTERA		CAENIDAE			CAENIS		DIMINUTA
1005	1156	ARTHROPODA	INSECTA	EPHEMEROPTERA		CAENIDAE			CAENIS		PUNCTATA1006
	1214	ARTHROPODA	INSECTA	EPHEMEROPTERA		LEPTOPHLEBIIDAE			CHOROTERPES		BASALIS
1007	1165	ARTHROPODA	INSECTA	EPHEMEROPTERA		BAETIDAE			CLOEON		RUBROPICTUM
1008	1280	ARTHROPODA	INSECTA	EPHEMEROPTERA		EPHEMERIDAE			EPHEMERA		SIMULANS
1009	2153	ARTHROPODA	INSECTA	EPHEMEROPTERA		EPHEMERELLIDAE			EURLYOPHELLA		BARTONI
1012	1299	ARTHROPODA	INSECTA	EPHEMEROPTERA		EPHEMERELLIDAE			EURYLOPHELLA		BICOLOR
1014	1273	ARTHROPODA	INSECTA	EPHEMEROPTERA		EPHEMERELLIDAE			EURYLOPHELLA		TEMPORALIS
1016	1281	ARTHROPODA	INSECTA	EPHEMEROPTERA		EPHEMERIDAE			HEXAGENIA		LIMBATA

Appendix 2: Taxonomic List and associated database Codes

MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
1021	1162	ARTHROPODA	INSECTA	EPHEMEROPTERA		SIPHLONURIDAE	SIPHLONURINAE		SIPHLONURUS		ALTERNATUS
1024	1187	ARTHROPODA	INSECTA	EPHEMEROPTERA		METRETOPODIDAE			SIPHLOPLECTON		BASALE
1026	1227	ARTHROPODA	INSECTA	EPHEMEROPTERA		HEPTAGENIIDAE	HEPTAGENIINAE		STENACRON		INTERPUNCTATUM
		ARTHROPODA	INSECTA	EPHEMEROPTERA		HEPTAGENIIDAE	HEPTAGENIINAE		STENONEMA		FEMORATUM
1032	1199	ARTHROPODA	INSECTA	EPHEMEROPTERA			LEPTOPHLEBIIDAE		LEPTOPHLEBIA		CUPIDA
1100	1577	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	AESHNIDAE					
1101	1498	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	AESHNIDAE	AESHNINAE		AESHNA		CANADENSIS
1102	1495	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	AESHNIDAE	AESHNINAE		AESHNA		EREMITA
1104	1573	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	AESHNIDAE	AESHNINAE		AESHNA		UMBROSA
1105	1590	ARTHROPODA	INSECTA	ODONATA	ZYGOPTERA	COENAGRIIDAE			ARGIA		VIOLACEA
1106	1503	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	AESHNIDAE	GOMPHAESCHINAE		BASIAESCHNA		JANATA
1108	1501	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	AESHNIDAE	GOMPHAESCHINAE		BOYERIA		GRAFIANA
1109	1559	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	LIBELLULIDAE			CELITHEMIS		EPONINA
1110	1481	ARTHROPODA	INSECTA	ODONATA	ZYGOPTERA	COENAGRIIDAE			CHROMAGRION		CONDITUM
1112	1487	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	CORDULEGASTRIDAE			CORDULEGASTER		
1114	1561	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	CORDULIIDAE			CORDULIA		SHURTLEFFI
1116	1523	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	MACROMIIDAE			DIDYMOPS		TRANSVERSA
1117	2144	ARTHROPODA	INSECTA	ODONATA		GOMPHIDAE			DROMOGOMPHUS		SPINOSUS
1118	1591	ARTHROPODA	INSECTA	ODONATA	ZYGOPTERA	COENAGRIIDAE			ENALLAGMA		CYATHIGERUM
1119	1592	ARTHROPODA	INSECTA	ODONATA	ZYGOPTERA	COENAGRIIDAE			ENALLAGMA		BOREALE
1120	1596	ARTHROPODA	INSECTA	ODONATA	ZYGOPTERA	COENAGRIIDAE			ENALLAGMA		EXSULANS
1122	1461	ARTHROPODA	INSECTA	ODONATA	ZYGOPTERA	COENAGRIIDAE			ENALLAGMA		HAGENI
1124	1462	ARTHROPODA	INSECTA	ODONATA	ZYGOPTERA	COENAGRIIDAE			ENALLAGMA		VESPERUM
1126	1539	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	GOMPHIDAE	HAGENIINAE		HAGENIUS		BREVISTYLUS
1128	1544	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	GOMPHIDAE	GOMPHINAE		GOMPHUS	GOMPHUS	EXILIS
1130	1474	ARTHROPODA	INSECTA	ODONATA	ZYGOPTERA	COENAGRIIDAE			ISCHNURA		VERTICALIS
1132	1492	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	LIBELLULIDAE			LIBELLULA		JULIA
1133	1470	ARTHROPODA	INSECTA	ODONATA	ZYGOPTERA	LESTIDAE			LESTES		DISJUNCTUS
1134	1469	ARTHROPODA	INSECTA	ODONATA	ZYGOPTERA	LESTIDAE			LESTES		VIGILAX
1135	1493	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	LIBELLULIDAE			LIBELLULA		QUADRIMACULATA
1136	1581	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	LIBELLULIDAE			LEUCORRHINIA		FRIGIDA
1138	1494	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	LIBELLULIDAE			LEUCORRHINIA		HUDSONICA
1140	1579	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	LIBELLULIDAE			LIBELLULA		INCESTA
1142	1518	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	CORDULIIDAE			SOMATOCHLORA		WILLIAMSONI
1144	1519	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	CORDULIIDAE			EPITHECA		CYNOSURA
1146	1524	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	MACROMIIDAE			MACROMIA		ILLINOIENSIS
1148	2145	ARTHROPODA	INSECTA	ODONATA		AESHNIDAE			NASIAESCHNA		PENTACA
1150	1565	ARTHROPODA	INSECTA	ODONATA	ANISOPTERA	CORDULIIDAE			SOMATOCHLORA		CINGULATA
1200	1613	ARTHROPODA	INSECTA	PLECOPTERA							
1201	1650	ARTHROPODA	INSECTA	PLECOPTERA		PERLODIDAE	ISOPERLINAE		ISOPERLA		MARLYNIA
1202	1698	ARTHROPODA	INSECTA	PLECOPTERA		NEMOURIDAE			NEMOURA		TRISPINOSA
1204	2159	ARTHROPODA	INSECTA	PLECOPTERA		NEMOURIDAE	NEMOURINAE		SOYEDINA		
1300	1402	ARTHROPODA	INSECTA	HEMIPTERA		BELOSTOMATIDAE					
1301	1381	ARTHROPODA	INSECTA	HEMIPTERA		NOTONECTIDAE			BUENOA		MACROTIBIALIS
1302	1455	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			CENOCORIXA		
1303	1404	ARTHROPODA	INSECTA	HEMIPTERA		BELOSTOMATIDAE			BELOSTOMA		FLUMINIUM
1304	2146	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			CORIXIDAE		
1306	1425	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			HESPEROCORIXA		ATOPODONTA
1308	1437	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			HESPEROCORIXA		KENNICOTTI

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MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
1310	1416	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			HESPEROCORIXA		LOBATA
1312	1335	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			HESPEROCORIXA		MICHIGANENSIS
1314	1418	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			HESPEROCORIXA		VULGARIS
1315	1346	ARTHROPODA	INSECTA	HEMIPTERA		BELOSTOMATIDAE			LETHOCERUS		AMERICANUS
1316	1382	ARTHROPODA	INSECTA	HEMIPTERA		NOTONECTIDAE			NOTONECTA		INSULATA
1318	1384	ARTHROPODA	INSECTA	HEMIPTERA		NOTONECTIDAE			NOTONECTA		UNDULATA
1319	1432	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			PALMACORIXA		BUENOI
1320	1417	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			SIGARA	ARCTOSIGARA	DECORATELLA
1321	1395	ARTHROPODA	INSECTA	HEMIPTERA		NEPIDAE			RANATRA		FUSCA
1322	1423	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			SIGARA	ARCTOSIGARA	PENNIENSIS
1324	1341	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			SIGARA	PHAEOSIGARA	COMPRESSOIDEA
1326	1340	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			SIGARA	PHAEOSIGARA	MACKINACENSIS
1328	1426	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			SIGARA	PHAEOSIGARA	MACROPALA
1329	2147	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			SIGARA	PHAEOSIGARA	MISSISSIPPIENSIS
1330	1410	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			SIGARA	PILEOSIGARA	DOUGLASENSIS
1332	1436	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			SIGARA	VERMISIGARA	DEFLECTA
1334	1421	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			SIGARA	VERMISIGARA	JOHNSONI
1335	1419	ARTHROPODA	INSECTA	HEMIPTERA		CORIXIDAE			SIGARA	VERMICORIXA	MULLETTENSIS
1400	2157	ARTHROPODA	INSECTA	MEGALOPTERA							
1402	1615	ARTHROPODA	INSECTA	MEGALOPTERA		CORYDALIDAE			CHAULIODES		
1404	1616	ARTHROPODA	INSECTA	MEGALOPTERA		SIALIDAE			SIALIS		
1500	1604	ARTHROPODA	INSECTA	NEUROPTERA		HEMEROBIIDAE					
1502	1601	ARTHROPODA	INSECTA	NEUROPTERA		SISYRIDAE			CLIMACIA		AREOLARIS
1600	1715	ARTHROPODA	INSECTA	TRICHOPTERA							
1602	1713	ARTHROPODA	INSECTA	TRICHOPTERA		SERICOSTOMATIDAE			AGARODES		DISTINCTUS
1603	1807	ARTHROPODA	INSECTA	TRICHOPTERA		PHRYGANEIDAE	PHRYGANEINAE		AGRYPNIA		IMPROBA
1604	1773	ARTHROPODA	INSECTA	TRICHOPTERA		PHRYGANEIDAE	PHRYGANEINAE		AGRYPNIA		VESTITA
1605	1804	ARTHROPODA	INSECTA	TRICHOPTERA		PHRYGANEIDAE	PHRYGANEINAE		AGRYPNIA		STRAMINEA
1608	1811	ARTHROPODA	INSECTA	TRICHOPTERA		PHRYGANEIDAE	PHRYGANEINAE		BANKSIOLA		SMITHI
1609	1808	ARTHROPODA	INSECTA	TRICHOPTERA		PHRYGANEIDAE	PHRYGANEINAE		BANKSIOLA		CROTCHI
1610	1864	ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE	LEPTOCERINAE	ARTHRISPINDINI	CERACLEA		ALCES
1611	1810	ARTHROPODA	INSECTA	TRICHOPTERA		PHRYGANEIDAE	PHRYGANEINAE		BANKSIOLA		DOSSUARIA
1612	1937	ARTHROPODA	INSECTA	TRICHOPTERA		HYDROPTILIDAE	HYDROPTILINAE		HYDROPTILA		
1613	1861	ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE	LEPTOCERINAE	ARTHRISPINDINI	CERACLEA		
1614	1909	ARTHROPODA	INSECTA	TRICHOPTERA		LEPIDOSTOMATIDAE			LEPIDOSTOA		
1615	1925	ARTHROPODA	INSECTA	TRICHOPTERA		HYDROPSYCHIDAE	DIPLECTRONINAE		DIPLECTRONA		MODESTA
1616	1981	ARTHROPODA	INSECTA	TRICHOPTERA		PSYCHOMYIIDAE	PSYCHOMYIINAE		LYPE		DIVERSA
1618	1758	ARTHROPODA	INSECTA	TRICHOPTERA		MOLANNIDAE	MOLANNA		ULMERINA-UNIOPHILA		
1619	1899	ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE	LEPTOCERIDAE				
1620	1932	ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE	LEPTOCERINAE	MYSTACIDINI	MYSTACIDES		SEPULCHRALIS
1622	1862	ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE	LEPTOCERINAE	LEPTOCERINI	NECTOPSYCHE		
1624	2148	ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE	LEPTOCERINAE	LEPTOCERINI	NECTOPSYCHE		SP. 2
1626	2149	ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE	LEPTOCERINAE	LEPTOCERINI	NECTOPSYCHE		SP. 3
1627	1827	ARTHROPODA	INSECTA	TRICHOPTERA		LIMNEPHILIDAE	LIMNEPHILINAE	LIMNOPHILINI	NEMOTAULIUS		HOSTILIS
1628	1967	ARTHROPODA	INSECTA	TRICHOPTERA		POLYCENTROPODIDAE	POLYCENTROPODINAE		NYCTIOPHYLAX		AFFINIS
1630	1865	ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE	LEPTOCERINAE	OECETINI	OECETIS		CINERASCENS
1632	1929	ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE	LEPTOCERINAE	OECETINI	OECETIS		
		ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE	LEPTOCERINAE	OECETINI	OECETIS		PERSIMILIS
1642	2150	ARTHROPODA	INSECTA	TRICHOPTERA		HYDROPTILIDAE	HYDROPTILINAE		OXYETHIRA		SP. 2
1644	2230	ARTHROPODA	INSECTA	TRICHOPTERA		HYDROPTILIDAE	HYDROPTILINAE		OXYETHIRA		SP. 3

Appendix 2: Taxonomic List and associated database Codes

MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
1645	1799	ARTHROPODA	INSECTA	TRICHOPTERA		PHRYGANEIDAE	PHRYGANEINAE			PHRYGANEA	
1646	2156	ARTHROPODA	INSECTA	TRICHOPTERA		HYDROPTILIDAE	HYDROPTILINAE			OXYETHIRA	SP. 4
		ARTHROPODA	INSECTA	TRICHOPTERA					ORTHOTRICHIA		
1648	1983	ARTHROPODA	INSECTA	TRICHOPTERA		POLYCENTROPODIDAE		DISPSEUDOPSINAE		PHYLOCENTROPUS	
1650	1885	ARTHROPODA	INSECTA	TRICHOPTERA		LIMNEPHILIDAE	LIMNEPHILINAE	LIMNEPHILINI		PLATYCENTROPUS	
1652	2231	ARTHROPODA	INSECTA	TRICHOPTERA		POLYCENTROPODIDAE		POLYCENTROPODINAE		POLYCENTROPUS	SP. 1
1654	2232	ARTHROPODA	INSECTA	TRICHOPTERA		POLYCENTROPODIDAE		POLYCENTROPODINAE		POLYCENTROPUS	SP. 2
1656	1798	ARTHROPODA	INSECTA	TRICHOPTERA		PHRYGANEIDAE	PHRYGANEINAE		PTILOSTOMIS		OCELLIFERA
1658	1889	ARTHROPODA	INSECTA	TRICHOPTERA		LIMNEPHILIDAE	LIMNEPHILINAE	LIMNEPHILINI		PYCNOPSYCHE	
1662	1933	ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE	LEPTOCERINAE	MYSTACIDINI		TRIAENODES	SP. 1
1664	1933	ARTHROPODA	INSECTA	TRICHOPTERA		LEPTOCERIDAE	LEPTOCERINAE	MYSTACIDINI		TRIAENODES	SP. 2
1666	1873	ARTHROPODA	INSECTA	TRICHOPTERA		LIMNEPHILIDAE			LIMNEPHILIDAE		
1700	2233	ARTHROPODA	INSECTA	LEPIDOPTERA							
1701	2236	ARTHROPODA	INSECTA	LEPIDOPTERA		PYRALIDAE	SCHOENOBIINAE			ACENTRIA	SP. 3
1702	2234	ARTHROPODA	INSECTA	LEPIDOPTERA		PYRALIDAE	SCHOENOBIINAE			ACENTRIA	SP. 1
1703	2235	ARTHROPODA	INSECTA	LEPIDOPTERA		PYRALIDAE	SCHOENOBIINAE			ACENTRIA	SP. 2
1704	1623	ARTHROPODA	INSECTA	LEPIDOPTERA		PYRALIDAE	CRAMBINAE		CRAMBUS		
1705	2237	ARTHROPODA	INSECTA	LEPIDOPTERA		PYRALIDAE	CRAMBINAE		CRAMBUS		SP. 2
1706	1705	ARTHROPODA	INSECTA	LEPIDOPTERA		GEOMETRIDAE			GEOMETRIDAE		
1708	2238	ARTHROPODA	INSECTA	LEPIDOPTERA		PYRALIDAE	NYMPHULINAE		EOPARARGYRACTIS		
1709	1621	ARTHROPODA	INSECTA	LEPIDOPTERA		PYRALIDAE	NYMPHYLINAE		PARAPONYX		
1800	2239	ARTHROPODA	INSECTA	COLEOPTERA							
1801	410	ARTHROPODA	INSECTA	COLEOPTERA		DYTISCIDAE			AGABUS		ANTHRACINUS
1802	2240	ARTHROPODA	INSECTA	COLEOPTERA		DYTISCIDAE			AGABUS		
1803	517	ARTHROPODA	INSECTA	COLEOPTERA		DYTISCIDAE			AGABUS		
1804	448	ARTHROPODA	INSECTA	COLEOPTERA		GYRINIDAE			DINEUTUS		HORNI
1806	450	ARTHROPODA	INSECTA	COLEOPTERA		GYRINIDAE			DINEUTUS		NIGRIOR
1808	571	ARTHROPODA	INSECTA	COLEOPTERA		CHRYSOMELIDAE			DONACIA		
1810	592	ARTHROPODA	INSECTA	COLEOPTERA		ELMIDAE			DUBIRAPHIA		MINIMA-VITATTA
1812	477	ARTHROPODA	INSECTA	COLEOPTERA		PSEPHENIDAE			ECTOPRIA		NERVOSA
1814	457	ARTHROPODA	INSECTA	COLEOPTERA		GYRINIDAE			GYRINUS		AFFINIS
1815	362	ARTHROPODA	INSECTA	COLEOPTERA		DYTISCIDAE			GRAPHODERUS		LIBERUS
1816	461	ARTHROPODA	INSECTA	COLEOPTERA		GYRINIDAE			GYRINUS		FROSTI
1817	2241	ARTHROPODA	INSECTA	COLEOPTERA		GYRINIDAE			GYRINUS		AERATUS
1818	463	ARTHROPODA	INSECTA	COLEOPTERA		GYRINIDAE			GYRINUS		LATILIMBUS
1820	462	ARTHROPODA	INSECTA	COLEOPTERA		GYRINIDAE			GYRINUS	SAYI	(=LUGENS)
1822	442	ARTHROPODA	INSECTA	COLEOPTERA		GYRINIDAE			GYRINUS		PECTORALIS
1824	467	ARTHROPODA	INSECTA	COLEOPTERA		GYRINIDAE			GYRINUS		VENTRALIS
1828	490	ARTHROPODA	INSECTA	COLEOPTERA		HALIPLIDAE			HALIPLUS		PANTHERINUS
1830	348	ARTHROPODA	INSECTA	COLEOPTERA		HYDROPHILIDAE			HYDROCHUS		
1832	374	ARTHROPODA	INSECTA	COLEOPTERA		DYTISCIDAE			HYDROPORUS	NEOPORUS	UNDULATUS
1834	527	ARTHROPODA	INSECTA	COLEOPTERA		ELMIDAE			MACRONYCHUS		GLABRATUS
1836	478	ARTHROPODA	INSECTA	COLEOPTERA		MELYRIDAE			MELYRIDAE		
1837	2242	ARTHROPODA	INSECTA	COLEOPTERA		STAPHYLINIDAE			PHYTOSUS		
1838	485	ARTHROPODA	INSECTA	COLEOPTERA		HELODIDAE			PRIONOCYPHON		
1840	2243	ARTHROPODA	INSECTA	COLEOPTERA		SCIRTIDAE			SCIRTES		SP. 1
1842	2244	ARTHROPODA	INSECTA	COLEOPTERA		SCIRTIDAE			SCIRTES		SP. 2
1844	2245	ARTHROPODA	INSECTA	COLEOPTERA		SCIRTIDAE			SCIRTES		SP. 3

Appendix 2: Taxonomic List and associated database Codes

MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
1846	573	ARTHROPODA	INSECTA	COLEOPTERA		ELMIDAE			STENELMIS		CRENATA
1848	345	ARTHROPODA	INSECTA	COLEOPTERA		HYDROPHILIDAE			BEROSUS		
1850	390	ARTHROPODA	INSECTA	COLEOPTERA		DYTISCIDAE			COPTOTOMUS		LONGULUS
1852	480	ARTHROPODA	INSECTA	COLEOPTERA		HELODIDAE			CYPHON		
1854	347	ARTHROPODA	INSECTA	COLEOPTERA		HYDROPHILIDAE			TROPISTERNUS		MIXTUS
1856	525	ARTHROPODA	INSECTA	COLEOPTERA		ELATERIDAE			ELATERIDAE		
		ARTHROPODA	INSECTA	COLEOPTERA		DYTISCIDAE			LACCOPHILUS		MACULOSUS
2000	433	ARTHROPODA	INSECTA	DIPTERA							
2100	882	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE					
2101	763	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		ALLUAUDOMYIA		
2102	754	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	FORCIPOMYIINAE		ATRICHOPOGON	POLYDACTYLUS	
2104	2216	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		BEZZIA		SP. 1
2106	2218	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		BEZZIA		SP. 1A
2108	2219	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		BEZZIA		SP. 2/2A
2110	2220	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		BEZZIA		SP. 3
2112	2221	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		BEZZIA		SP. 4
2114	2152	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		BEZZIA		SP. 5
2116	2222	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		BEZZIA		SP. 6
2117	2224	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		BEZZIA		SP. 8
2118	2223	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		BEZZIA		SP. 7
2120	766	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		CULICOIDES		STELLIFER
2122	2225	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		CULICOIDES		SP. 1
2124	2226	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		CULICOIDES		SP. 2
2126	755	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	FORCIPOMYIINAE		FORCIPOMYIA		
2128	2227	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	DASYHELEINAE		DASYHELEA		SP. 1
2130	2228	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	DASYHELEINAE		DASYHELEA		SP. 2
2132	695	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		MALLOCHOHELEA		
2133	2229	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	DASYHELEINAE		DASYHELEA		SP. 3
2136	694	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE			MONOHELEA		
		ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE			MONOHELEA		SP.2
2140	696	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE			ISOHELEA		
2142	770	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		PALPOMYIA		TIBIALIS
2144	771	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		PALPOMYIA		SP.2
2146	2208	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		PROBEZZIA		SP. 1
2148	2209	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		PROBEZZIA		SP. 2
2150	2210	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		PROBEZZIA		SP. 3
2152	2211	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		PROBEZZIA		SP. 4
2153	2212	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		PROBEZZIA		SP. 5
2154	683	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		STILOBEZZIA		
2155		ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CERATOPOGONIDAE	CERATOPOGONINAE		PROBEZZIA		SP. 6
2200	2003	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE					
2300	842	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	PODONOMINAE	PODONOMINI			
2302	724	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	PODONOMINAE	PODONOMINI	PAROCHLUS		KIEFFERI
2400	547	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE				
2401	898	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	AHLABESMYIA	ABLABESMYIA	MALLOCHII
2402	721	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	AHLABESMYIA	ABLABESMYIA	ASPERA
2403	2213	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE		ABLABESMYIA	ASAYIA	ANNULATA

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MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
2404	805	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	MACROPELOPINI	APSECTROTANYPUS		JOHNSONI
2405	897	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	ABLABESMYIA	ABLABESMYIA	PARAJANTA
2406	546	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE		BRUNDINELLA		EUMORPHA
2407	2020	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	ABLABESMYIA	ABLABESMYIA	MONILIS
2408	549	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	COELOTANYPODINI	CLINOTANYPUS		PINGUIS
2409	2214	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE		ABLABESMYIA	KARELIA	ILLINOENSIS
2410	811	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	CONCHAPELOPIA		
2411	798	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	ABLABESMYIA	ABLABESMYIA	PEELENSIS
2412	548	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	MACROPELOPINI	DJALMABATISTA		PULCHER
2414	809	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	GUTTIPELOPIA		GUTTIPENNIS
2416	552	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	LABRUNDINIA		PILOSELLA
2418	814	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	LABRUNDINIA		NEOPILOSELLA
2419	800	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	LABRUNDINIA		
2420	813	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	LARSIA		CANADENSIS
2422	550	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	LARSIA		INDISTINCTA
		ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	LARSIA		BERNERI
2424	812	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	NATARSIA		BALTIMOREUS
2426	802	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	MACROPELOPINI	PROCLADIUS	HOLOTANYPUS	
2428	796	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	THIENEMANNIMYIA		NORENA
2430	2018	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	PENTANEURINI	TRISSOPELOPIA		OGEMAWI
2432	2215	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE		ZAVRELIMYIA		SP. 1
2434	2203	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE		ZAVRELIMYIA		
2500	714	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	DIAMESINAE	DIAMESINI			
2501	802	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	TANYPODINAE	MACROPELOPINI	PROCLADIUS		
2502	2204	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	DIAMESINAE		PROTANYPUS		RAMOSUS
2503	857	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	DIAMESINAE	PROTANYPINI	PROTANYPUS		RAMOSUS
2600	711	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	DIAMESINAE	PRODIAMENSINI			
2602	710	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	DIAMESINAE	PRODIAMENSINI	MONODIAMESA		BATHYPHILA
2700	840	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE				
2702	725	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		ACRIOTOPUS		
2704	839	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		BRILLIA		PARVA
2706	838	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		BRYOPHAENOCLADIUS		
2708	1327	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CORYNONEURA		LACUSTRIS
2710	1328	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CORYNONEURA		LOBATA
2711		ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		BRILLIA		FLAVIFRONS
2712	539	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CORYNONEURA		SCUTELLATA
2714	2205	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CORYNONEURA		SP. 1
2716	2206	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CORYNONEURA		SP. 2
2717	2207	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CORYNONEURA		SP. 3
2718	1711	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CRICOTOPUS	CRICOTOPUS	ALBIFORCEPS
2719	1136	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CRICOTOPUS		
		ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CRICOTOPUS	CRICOTOPUS	BICINCTUS
2720	500	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CRICOTOPUS	CRICOTOPUS	CYLINDRACEUS
2722	502	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CRICOTOPUS	CRICOTOPUS	FESTIVELLUS
2724	501	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CRICOTOPUS	CRICOTOPUS	CURTUS
2726	438	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CRICOTOPUS	CRICOTOPUS	TREMULUS
2728	437	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CRICOTOPUS	ISOCLADIUS	INTERSECTUS
2730	823	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CRICOTOPUS	ISOCLADIUS	LARICOMALIS
2732	2155	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CRICOTOPUS	ISOCLADIUS	SP. 1
2733	2154	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		CRICOTOPUS	ISOCLADIUS	SP. 2

Appendix 2: Taxonomic List and associated database Codes

MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
2734	1709	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		DIPLOCLADIUS		
2736	1708	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		DOITHRIX		SP. 1
2737	2190	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		EPOICOCLADIUS		SP. 1
2738	1708	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		DOITHRIX		SP. 2
2739	822	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		EPOICOCLADIUS		FLAVENS
2740	496	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		HELENIELLA		
2742	675	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		HETEROTANYTARSUS		NUDALUS
2744	676	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		HETEROTRISSOCLADIUS		CHANGI
2746	677	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		HETEROTRISSOCLADIUS		HIRTAPEX
2748	821	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		HYDROBAENUS		FUSISTYLUS
2749		ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		NANOCLADIUS		DISTINCTUS
2750	680	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		LIMNOPHYES		
2751	681	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		NANOCLADIUS	NANOCLADIUS	INCOMPTUS
2752	719	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		NANOCLADIUS	NANOCLADIUS	MINIMUS
2753		ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		NANOCLADIUS	PLECOPTERACOLUTHUS	DOWNSEI
2754	2191	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		NANOCLADIUS		NANOCLADIUS
2755		ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PARACRICOPTUS		
2756	1143	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		ORTHOCLADIUS	ORTHOCLADIUS	ANNECTENS
2757	2192	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PARACLADIUS		
2758	2193	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PARAKIEFFERIELLA		SP. 1
2759	2194	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PARAKIEFFERIELLA		SP. 2
2760	2195	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PARAKIEFFERIELLA		SP. 3
2761	2196	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PARAKIEFFERIELLA		SP. 4
2762	1138	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PARAMETRIOCNEMUS		LUNDBECKI
2764	1141	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PARAPHAENOCLADIUS		NATHECUS
2766	1140	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PARAPHAENOCLADIUS		
2768	1144	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PLATYSMITTIA		
2769	2197	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PSECTROCLADIUS	ALLOPSECTROCLADIUS	
		ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PSECTROCLADIUS	ALLOPSECTROCLADIUS	PILOSUS
2770	1727	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PSECTROCLADIUS	MESOPSECTROCLADIUS	
2772	891	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PSECTROCLADIUS	MONOPSECTROCLADIUS	CALCARATUS
2774	1729	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PSECTROCLADIUS	PSECTROCLADIUS	LITOFILUS
2776	674	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PSECTROCLADIUS	PSECTROCLADIUS	SIMULANS
2777	666	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PSECTROCLADIUS	PSECTROCLADIUS	SORDIDELLUS
2778	1132	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PSEUDORTHOCLADIUS		
2780	1131	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PSEUDOSMITTIA		FORCIPATA
2781	2199	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PSEUDOSMITTIA		SP. 2
2782	2198	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		PSEUDOSMITTIA		SP. 1
2784	667	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		RHEOCRICOTOPUS		
2786	1129	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		SMITTIA		
2788	1724	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		STACKELBERGINA		
2790	720	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		SYNORTHOCLADIUS		SEMIVIRENS
2792	1324	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		THIENEMANNIELLA		
2794	1325	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		TVETANIA		BAVARICA
2796	884	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		TVETANIA		DISCOLORIPES
2797	818	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		XYLOTOPUS		
2798	817	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		ZALUTSCHIA		OBSEPTA
2799	819	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	ORTHOCLADIINAE		ZALUTSCHIA		SP. 1
2800	1120	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE				

Appendix 2: Taxonomic List and associated database Codes

MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
2900	1120	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI			
2902	1113	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	CLADOPELMA		
2904	793	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	CHIRONOMUS	CAMPTOCHIRONOMUS	TENTANS
2906	669	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	CHIRONOMUS		
2908	1999	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	CRYPTOCHIRONOMUS		CONUS
2910	2001	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	CRYPTOCHIRONOMUS		
2912	787	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	DEMICRYPTOCHIRONOMUS	IRMAKIA	CUNEATUS
2914	791	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	DICROTENDIPES		LEUCOSCELIS
2916	878	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	DICROTENDIPES		MODESTUS
2917	2200	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	DICROTENDIPES		NERVOSUS
2918	786	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	DICROTENDIPES		TRITOMUS
2920	876	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	ENDOCHIRONOMUS		NIGRICANS
2922	2201	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	GLYPTOTENDIPES		SP. 1
2923	2202	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	GLYPTOTENDIPES		SP. 2
2924	2177	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	GLYPTOTENDIPES		
2925	2178	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	KIEFFERULUS		DUX
2926	1119	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	LAUTERBORNIELLA		AGRAYLOIDES
2927		ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	GLYPTOTENDIPES		SP. 3
2928	1112	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	MICROTENDIPES		PEDELLUS
2930	784	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	NILOTHAUMA		BABIYI
2932	785	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	NILOTHAUMA		
2935	1117	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	OMISUS		CALEDONICUS
2936	783	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	OMISUS		PICA
2938	1125	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PAGASTIELLA		OSTANSA
2940	1127	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PARACHIRONOMUS		ABORTIVUS
2942	778	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PARACLADOPELMA		GALAPTERA
2944	690	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PARACLADOPELMA		UNDINE
2946	854	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PARACLADOPELMA		
2948	1106	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PARALAUTERBORNIELLA		NIGROHALTERALIS
2950	1319	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PARATENDIPES		ALBIMANUS
2952	1320	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PARATENDIPES		NUDISQUAMA
2954	693	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PHAENOPSECTRA		
2956	895	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	PENTAPEDILUM	SORDEN
2958	1323	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	PENTAPEDILUM	TRITUM
2960	691	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM		CONVICTUM
2962	2179	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM		SP. 1
2964	2180	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM		SP. 2
2966	2182	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM		SP. 3
2968	2183	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM		SP. 4
2970	779	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	TRIPODURA	SCALAENUM
2972	1321	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	TRIPODURA	SIMULANS
2974	855	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PSEUDOCHIRONOMUS		ARTICAUDUS
2975	2189	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PSEUDOCHIRONOMUS		SP. 1
2976	2163	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PSEUDOCHIRONOMUS		SP. 2
2977	2164	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PSEUDOCHIRONOMUS		SP. 3
2978	890	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	SERGENTIA		CORACINA
2979	2165	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PSEUDOCHIRONOMUS		SP. 4
2980	1105	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	STENOCHIRONOMUS		HILARIS
2982	879	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	STICTOCHIRONOMUS		SP.1/3

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MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
2984	692	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	PHAENOPSECTRA		FLAVIPES
2986	835	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	TRIBELOS		JUCUNDUM
2988	2167	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	ZAVRELIELLA		MARMORATA
2990	2185	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	POLYPEDILUM	FALLAX
2991	1322	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	POLYPEDILUM	ILLINOENSE
2992	2186	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	POLYPEDILUM	TRIGONUM
2993	2181	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM		SP. 2A
2994	2184	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM		SP. 5
2995	2187	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	TRIPODURA	SP. 1
2996	2166	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	STICTOCHIRONOMUS		SP. 2
2997	836	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	XENOCHIRONOMUS		XENOLABIS
2999	2188	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	CHIRONOMINI	POLYPEDILUM	TRIPODURA	SP. 2
3000	706	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	TANYTARSINI			
3002	867	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	TANYTARSINI	CLADOTANYTARSUS		
3004	864	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	TANYTARSINI	PARAPSECTRA		
3006	866	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	TANYTARSINI	PARATANYTARSUS		
3008	873	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	TANYTARSINI	STEMPELLINA		
3010	871	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	TANYTARSINI	STEMPELLINELLA		
3012	700	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	TANYTARSINI	TANYTARSUS		CURTICORNIS
3014	863	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	TANYTARSINI	TANYTARSUS		
3016	2168	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	TANYTARSINI	CHIRONOMIDAE		
3018	869	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHIRONOMIDAE	CHIRONOMINAE	TANYTARSINI	ZAVRELIA		
3100	731	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	TABANIDAE					
3102	961	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	TABANIDAE			CHRYSOPS		ATER
3103	831	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	TABANIDAE			CHRYSOPS		EXCITANS
3104	2169	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	TABANIDAE			CHRYSOPS		SP. 1
3106	2158	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	TABANIDAE			CHRYSOPS		
3108	2170	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	TABANIDAE			TABANUS		
3109	2171	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	TABANIDAE			TABANUS		MARGINALIS
3200	1237	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE					
3202	1258	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE	LIMONIINAE		DACTYLOLABIS		
3204	1265	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE	LIMONIINAE		HEXATOMA		
3206	1033	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE	LIMONIINAE		LIMONIA		
3208	1145	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE	LIMONIINAE		ERIOPTERA		
3210	1064	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE	LIMONIINAE		ORMOSIA		
3211	1250	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE	LIMONIINAE		PEDICIA		
3212	2172	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE			TIPULA		SP. 1
3214	1244	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE	TIPULINAE		TIPULA	NIPPOTIPULA	ABDOMINALIS
3216	2173	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE			TIPULA	YAMATOTIPULA	
3217	2174	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE			TIPULIDAE		SP. 1
3218	2151	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE			TIPULIDAE		SP. 2
3220	1262	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	TIPULIDAE	LIMONIINAE		GONOMYIA		
3302	2176	ARTHROPODA	INSECTA	DIPTERA		CECIDOMYIIDAE			CECIDOMYIIDAE		
3306	716	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	DIXIDAE			DIXELLA		
3308	2128	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	DOLICHOPODIDAE			DOLICHOPODIDAE		
3310	827	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	EMPIDIDAE			HEMERODROMIA		
3311	940	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	EMPIDIDAE			EMPIDIDAE		
3312	2160	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	PHORIDAE			PHORIDAE		
3314	2161	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	PLATYPEZIDAE			PLATYPEZA		SP. 1
3316	2162	ARTHROPODA	INSECTA	DIPTERA	BRACHYCERA	PLATYPEZIDAE			PLATYPEZA		SP. 2

Appendix 2: Taxonomic List and associated database Codes

MOENUM	DFONUM	PHYLUM	CLASS	FIRSTORDER	SUBORDER	FAMILY	SUBFAMILY	TRIBE	GENUS	SUBGENUS	SPECIES
3318	1016	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	PTYCHOPTERIDAE			BATTACOMORPHA		
3320	1101	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	PSYCHODIDAE			PSYCHODIDAE		
3322	1238	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	THAUMALEIDAE			THAUMALEA		
3500	2027	MOLLUSCA	GASTROPODA								
3502	2064	MOLLUSCA	GASTROPODA	MESOGASTROPODA		HYDROBIIDAE			AMNICOLA		LIMOSA
3503	2061	MOLLUSCA	GASTROPODA	MESOGASTROPODA		VIVIPARIDAE			CAMPELOMA		DECISUM
3504	2036	MOLLUSCA	GASTROPODA	BASOMMATOPHORA		ANCYLIDAE			FERRISSIA		FRAGILIS
3505	2059	MOLLUSCA	GASTROPODA	BASOMMATOPHORA		PLANORBIDAE			GYRAULUS		PARVUS
3506	2040	MOLLUSCA	GASTROPODA	BASOMMATOPHORA		PSYSIDAE			PHYSELLA	PHYSELLA	GYRINA
3508	2044	MOLLUSCA	GASTROPODA	BASOMMATOPHORA		PLANORBIDAE			HELISOMA		ANCEPS
3510	2029	MOLLUSCA	GASTROPODA	BASOMMATOPHORA		PLANORBIDAE			MENETUS		DILATATUS
3512	2060	MOLLUSCA	GASTROPODA	MESOGASTROPODA		VALVATIDAE			VALVATA		LEWISI
3600	2077	MOLLUSCA	PELECYPODA								
3602	2092	MOLLUSCA	PELECYPODA	VENEROIDA		SPHAERIIDAE	PISIDIINAE		PISIDIUM		CASERTANUM
3604	2090	MOLLUSCA	PELECYPODA	VENEROIDA		SPHAERIIDAE	PISIDIINAE		PISIDIUM		FERRUGINEUM
3606	2086	MOLLUSCA	PELECYPODA	VENEROIDA		SPHAERIIDAE	PISIDIINAE		PISIDIUM		LILLJEBORGI
3608	2093	MOLLUSCA	PELECYPODA	VENEROIDA		SPHAERIIDAE	PISIDIINAE		PISIDIUM		ADAMSI
3610	2080	MOLLUSCA	PELECYPODA	VENEROIDA		SPHAERIIDAE	PISIDIINAE		PISIDIUM		NITIDUM
3612	2081	MOLLUSCA	PELECYPODA	VENEROIDA		SPHAERIIDAE	PISIDIINAE		PISIDIUM		VARIABILE
3614	2089	MOLLUSCA	PELECYPODA	VENEROIDA		SPHAERIIDAE	PISIDIINAE		PISIDIUM		EQUILATERALE
3616	2102	MOLLUSCA	PELECYPODA	VENEROIDA		SPHAERIIDAE	SPHAERIINAE		MUSCULIUM		SECURIS
3618	2083	MOLLUSCA	PELECYPODA	VENEROIDA		UNIONIDAE			ANODONTA		
3620	2088	MOLLUSCA	PELECYPODA	VENEROIDA		SPHAERIIDAE	PISIDIINAE		PISIDIUM		SUBTRUNCATUM
3622	2079	MOLLUSCA	PELECYPODA	VENEROIDA		SPHAERIIDAE	SPHAERIINAE		MUSCULIUM	LACUSTRE	JAYENSE
3700	760	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHAOBORIDAE					
3702	685	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHAOBORIDAE	CHAOBORINAE		CHAOBORUS	CHAOBORUS	AMERICANUS
3704	684	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHAOBORIDAE	CHAOBORINAE		CHAOBORUS	CHAOBORUS	FLAVICANS
3706		ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CHAOBORIDAE	CHAOBORINAE		CHAOBORUS	SAYOMYIA	PUNCTIPENNIS
3800	604	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CULICIDAE					
3801	2175	ARTHROPODA	INSECTA	DIPTERA	NEMATOCERA	CULICIDAE			MANSONIA		PERTUBANS

APPENDIX 3

Fall benthic species lists for the eight low alkalinity lakes

CLAYTON LAKE OCT 11 1988

TAXONOMIC NAME	SITE				TOTAL	MEAN	STD
	1	2	3	4 sub			
NEMATODA	0	0	0	1	1	0.3	0.5
Mermithidae	0	0	0	1	1	0.3	0.5
OLIGOCHAETA	2	2	5	5	14	3.5	1.7
Enchytraeidae	0	0	0	1	1	0.3	0.5
Ilyodrilus templetoni	0	0	1	0	1	0.3	0.5
Lumbriculus variegatus	2	0	4	3	9	2.3	1.7
Tubificidae + hairs	0	2	0	1	3	0.8	1.0
HIRUDINEA	0	0	0	2	2	0.5	1.0
Erpobdella punctata	0	0	0	2	2	0.5	1.0
AMPHIPODA	4	42	5	51	102	25.5	24.5
Crangonyx laurentianus	4	42	5	51	102	25.5	24.5
DECAPODA	0	1	0	1	2	0.5	0.6
Cambarus (P.) robustus	0	1	0	1	2	0.5	0.6
EPHEMEROPTERA	53	19	13	49	134	33.5	20.4
Caenis diminuta	5	0	4	1	10	2.5	2.4
Eurylophella temporalis	32	2	2	1	37	9.3	15.2
Leptophlebia cupida	16	17	7	47	87	21.8	17.4
ODONATA	4	7	2	44	57	14.3	19.9
Aeshna eremita	0	1	0	0	1	0.3	0.5
Enallagma boreale	0	3	1	35	39	9.8	16.9
Gomphus exilis	3	1	1	1	6	1.5	1.0
Leucorrhinia hudsonica	0	1	0	7	8	2.0	3.4
Libellula julia	1	1	0	1	3	0.8	0.5

TAXONOMIC NAME	SITE				TOTAL	MEAN	STD
	1	2	3	4 sub			
DIPTERA	439	392	131	1116	2078	519.5	420.2
DIPTERA:Ceratopogonidae	133	66	3	40	242	60.5	54.8
Bezzia sp.1	97	50	1	3	151	37.8	45.5
Bezzia sp.1A	25	4	0	0	29	7.3	12.0
Bezzia sp.2/2A	5	6	0	0	11	2.8	3.2
Bezzia sp.3	4	5	0	1	10	2.5	2.4
Bezzia sp.4	0	0	1	35	36	9.0	17.3
Bezzia sp.6	0	0	0	1	1	0.3	0.5
Monohelea sp.	2	1	0	0	3	0.8	1.0
Probezzia sp.1	0	0	1	0	1	0.3	0.5
DIPTERA:Chironomidae	305	325	128	1076	1834	458.5	421.2
Subfam.-Tanypodinae	105	56	32	43	236	59.0	32.2
Ablabesmyia (s.str.) mallochi	59	1	5	0	65	16.3	28.6
Clinotanypus (s.str.) pinguis	5	7	0	0	12	3.0	3.6
Conchapelopia sp.	2	0	0	0	2	0.5	1.0
Procladius (Holotanypus) sp.	39	48	27	43	157	39.3	9.0
Subfam.-Orthocladiinae	2	7	7	0	16	4.0	3.6
Psectrocladius (Allops.) pilosus	0	1	1	0	2	0.5	0.6
Psectrocladius (Mono.) cf. calcaratus	0	2	0	0	2	0.5	1.0
Psectrocladius (s.str.) litofilus	1	2	3	0	6	1.5	1.3
Psectrocladius (s.str.) simulans	0	0	2	0	2	0.5	1.0
Stackelbergina n.sp.	0	1	0	0	1	0.3	0.5
Zalutschia obsepta	1	1	1	0	3	0.8	0.5

CLAYTON LAKE OCT 11 1988

TAXONOMIC NAME	SITE 1	SITE 2	SITE 3	SITE 4 sub	TOTAL	MEAN	STD
HEMIPTERA	1	18	1	30	50	12.5	14.2
Buenoa macrotibialis	1	0	0	0	1	0.3	0.5
Notonecta (Paranecta) undulata	0	10	1	21	32	8.0	9.8
Sigara (Phaeo.) macropala	0	8	0	9	17	4.3	4.9
MEGALOPTERA	2	0	1	0	3	0.8	1.0
Chauliodes sp.	1	0	0	0	1	0.3	0.5
Sialis sp.	1	0	1	0	2	0.5	0.6
TRICHOPTERA	6	4	0	9	19	4.8	3.8
Banksiola smithi	1	1	0	7	9	2.3	3.2
Molanna ulmerina-uniophila	1	2	0	0	3	0.8	1.0
Nyctiophylax affinis	2	0	0	1	3	0.8	1.0
Oecetis sp.1	2	0	0	1	3	0.8	1.0
Polycentropus sp.2	0	1	0	0	1	0.3	0.5
LEPIDOPTERA	0	1	0	0	1	0.3	0.5
Eoparargyractis sp.	0	1	0	0	1	0.3	0.5
COLEOPTERA	0	1	0	2	3	0.8	1.0
Hydroporus (Neoporus) undulatus	0	1	0	2	3	0.8	1.0

TAXONOMIC NAME	SITE 1	SITE 2	SITE 3	SITE 4 sub	TOTAL	MEAN	STD
Subfam.-Chironominae	198	262	89	1033	1582	395.5	431.1
Tribe-Chironomini	153	224	68	904	1349	337.2	383.2
Cladopelma sp.	2	0	0	0	2	0.5	1.0
Cryptochironomus conus	2	1	4	11	18	4.5	4.4
Cryptochironomus spp.	0	1	0	0	1	0.3	0.5
Dicrotendipes leucoscelis	6	0	7	0	13	3.3	3.8
Dicrotendipes modestus	1	0	0	0	1	0.3	0.5
Dicrotendipes tritomus	4	96	23	258	381	95.3	115.6
Glyptotendipes sp.1 gr."A"	0	0	1	0	1	0.3	0.5
Microtendipes pedellus	12	114	13	495	634	158.5	229.4
Pagastiella ostansa	81	0	0	0	81	20.3	40.5
Paratendipes albimanus	0	2	0	0	2	0.5	1.0
Polypedilum (Pentapedilum) tritum	0	1	0	0	1	0.3	0.5
Pseudochironomus articaudus	1	0	0	0	1	0.3	0.5
Pseudochironomus sp. 3	0	0	7	129	136	34.0	63.5
Stenochironomus hilaris	1	0	1	0	2	0.5	0.6
Tribelos jucundum	43	9	12	11	75	18.7	16.3
Tribe-Tanytarsini	45	38	21	129	233	58.3	48.3
Cladotanytarsus spp.	4	15	13	22	54	13.4	7.2
Stempellina sp.	0	0	0	11	11	2.7	5.4
Tanytarsus sp. 'Pc-brush'	0	3	2	43	48	12.0	20.7
Tanytarsus/Micropsectra spp.	41	20	6	54	121	30.2	21.3
DIPTERA:Chaoboridae	1	1	0	0	2	0.5	0.6
Chaoborus (s.str.) americanus	1	1	0	0	2	0.5	0.6
GASTROPODA	1	0	0	0	1	0.3	0.5
Ferrissia fragilis ?	1	0	0	0	1	0.3	0.5

CLYDE LAKE OCT 24 1988

TAXONOMIC NAME			SITE			TOTAL	MEAN	STD
	1	2	3	4	5			
		sub						
OLIGOCHAETA	1	1	1	6	7	16	3.2	3.0
Lumbriculus variegatus	1	1	1	6	7	16	3.2	3.0
AMPHIPODA	40	22	10	38	26	136	27.2	12.3
Crangonyx laurentianus	40	22	10	38	26	136	27.2	12.3
EPHEMEROPTERA	4	0	2	12	5	23	4.6	4.6
Leptophlebia cupida	4	0	2	12	5	23	4.6	4.6
ODONATA	78	16	21	41	109	265	53	39.7
Aeshna umbrosa	0	0	1	0	0	1	0.2	0.4
Cordulia shurtleffi	33	6	6	11	5	61	12.2	11.9
Enallagma boreale	0	4	1	0	2	7	1.4	1.7
Leucorrhinia hudsonica	45	4	9	29	102	189	37.8	39.4
Libellula julia	0	2	3	1	0	6	1.2	1.3
Libellula quadrimaculata	0	0	1	0	0	1	0.2	0.4
HEMIPTERA	3	3	27	5	54	92	18.4	22.3
Buenoa macrotibialis	0	1	0	0	0	1	0.2	0.4
Hesperocorixa vulgaris	0	1	0	1	4	6	1.2	1.6
Notonecta (Paranecta) undulata	3	0	2	4	11	20	4	4.2
Sigara (Arcto.) penniensis	0	0	5	0	0	5	1	2.2
Sigara (Phaeo.) macropala	0	1	20	0	39	60	12	17.3
TRICHOPTERA	19	33	8	40	32	132	26.4	12.8
Agrypnia improba	0	0	1	0	0	1	0.2	0.4
Agrypnia vestita	0	0	0	0	1	1	0.2	0.4
Banksiola crotchi	1	1	0	0	1	3	0.6	0.5
Banksiola smithi	13	25	5	30	24	97	19.4	10.2
Nectopsyche sp.1	1	0	0	1	0	2	0.4	0.5
Nemotaulius hostilis	0	0	0	4	0	4	0.8	1.8
Oecetis sp.1	3	2	1	1	0	7	1.4	1.1
Oecetis sp.2	0	0	0	0	1	1	0.2	0.4
Oxyethira sp.1	0	0	0	1	0	1	0.2	0.4
Platycentropus sp.	0	1	1	1	2	5	1	0.7
Polycentropus sp.1	1	4	0	0	2	7	1.4	1.7
Polycentropus sp.2	0	0	0	2	0	2	0.4	0.9
Ptilostomis cf. ocellifera	0	0	0	0	1	1	0.2	0.4
COLEOPTERA	1	0	0	1	2	4	0.8	0.8
Agabus sp. ELA	1	0	0	0	0	1	0.2	0.4
Gyrinus pectoralis	0	0	0	1	2	3	0.6	0.9

TAXONOMIC NAME			SITE			TOTAL	MEAN	STD
	1	2	3	4	5			
		sub						
DIPTERA	530	711	185	312	581	2319.1	463.8	212.2
DIPTERA:Ceratopogonidae	2	3	7	33	88	133	26.6	36.6
Bezzia sp.1	0	0	0	14	60	74	14.8	26.0
Bezzia sp.1A	0	0	0	0	1	1	0.2	0.4
Bezzia sp.2/2A	2	3	1	13	15	34	6.8	6.6
Bezzia sp.3	0	0	6	6	10	22	4.4	4.3
Monohelea sp.	0	0	0	0	2	2	0.4	0.9
DIPTERA:Chironomidae	527	706	173	277	492	2175.1	435.0	211.4
Subfam.-Tanypodinae	106	191	128	59	151	634.6	126.9	49.2
Ablabesmyia (s.str.) monilis	3	14.1	0	0	0	17.1	3.4	6.1
Ablabesmyia (Karelia) illinoensis	30	0	2	7	32	71	14.2	15.6
Clinotanypus (s.str.) pinguis	0	0	4	2	2	8	1.6	1.7
Procladius (Holotanypus) sp.	73	177	122	50	117	538.5	107.7	48.9
Subfam.-Orthocladiinae	215	113	10	80	64	482	96.4	76.0
Psectrocladius (Mono.) cf. calcaratus	1	0	0	1	10	12	2.4	4.3
Psectrocladius (s.str.) litofilus	213	113	10	79	51	466	93.2	76.9
Stackelbergina n.sp.	1	0	0	0	3	4	0.8	1.3
Subfam.-Chironominae	206	403	35	138	277	1058.5	211.7	139.1
Tribe-Chironomini	202	395	34	138	276	1045.4	209.1	136.9
Chironomus (s.str.) spp.	8	106	5	31	2	151.9	30.4	43.7
Cladopelma sp.	1	14.1	0	0	2	17.1	3.4	6.0
Cryptochironomus conus	0	0	0	0	4	4	0.8	1.8
Dicrotendipes modestus	158	28.2	0	2	107	295.2	59.0	70.3
Dicrotendipes tritomus	0	0	0	0	3	3	0.6	1.3
Endochironomus nigricans	5	0	2	1	11	19	3.8	4.4
Glyptotendipes sp.1 gr."A"	0	0	0	0	2	2	0.4	0.9
Microtendipes pedellus	15	35.3	2	12	54	118.3	23.7	20.8
Pagastiella ostansa	0	0	1	1	9	11	2.2	3.8
Polypedilum (s.str.) trigonum	1	7.1	0	0	0	8.1	1.6	3.1
Polypedilum (Tripodura) simulans	6	42.4	14	1	13	76.4	15.3	16.1
Stenochironomus hilaris	1	0	0	0	1	2	0.4	0.5
Tribelos jucundum	7	162	10	90	68	337.4	67.5	64.2
Tribe-Tanytarsini	4	7.1	1	0	1	13.1	2.6	2.9
Tanytarsus sp. 'Pe-brush'	2	0	0	0	1	3	0.6	0.9
Tanytarsus/Micropsectra spp.	2	7.1	1	0	0	10.1	2.0	3.0
DIPTERA:Tabanidae	1	0	2	1	1	5	1.0	0.7
Chrysops ?excitans	1	0	2	1	1	5	1.0	0.7
DIPTERA:Tipulidae	0	0	1	0	0	1	0.2	0.4
Dactylolabis sp.	0	0	1	0	0	1	0.2	0.4
DIPTERA:Chaoboridae	0	2	2	1	0	5	1.0	1.0
Chaoborus (s.str.) americanus	0	2	2	1	0	5	1.0	1.0

DOUGHNUT LAKE OCT 27 1988

TAXONOMIC NAME	SITE 1	2	3	4	5	TOTAL	MEAN	STD
NEMATODA	0	0	0	1	0	1	0.2	0.4
Anatonchus sp.	0	0	0	1	0	1	0.2	0.4
OLIGOCHAETA	2	4	0	15	11	32	6.4	6.3
Lumbriculus variegatus	2	4	0	15	9	30	6.0	6.0
Lumbriculidae	0	0	0	0	1	1	0.2	0.4
Tubificidae - hairs	0	0	0	0	1	1	0.2	0.4
HIRUDINEA	0	0	0	1	2	3	0.6	0.9
Nephelopsis obscura	0	0	0	1	2	3	0.6	0.9
AMPHIPODA	15	14	24	22	10	85	17.0	5.8
Crangonyx laurentianus	15	13	24	22	10	84	16.8	6.0
Hyalella azteca	0	1	0	0	0	1	0.2	0.4
EPHEMEROPTERA	13	16	10	20	10	69	13.8	4.3
Caenis diminuta	1	0	1	0	0	2	0.4	0.5
Eurylophella temporalis	11	13	8	17	8	57	11.4	3.8
Leptophlebia cupida	1	3	1	3	2	10	2.0	1.0
ODONATA	14	8	15	44	14	95	19.0	14.2
Aeshna eremita	0	1	0	0	0	1	0.2	0.4
Cordulia shurtleffi	1	0	1	3	0	5	1.0	1.2
Enallagma boreale	1	0	0	1	0	2	0.4	0.5
Leucorrhinia hudsonica	1	5	0	27	3	36	7.2	11.2
Libellula julia	11	2	14	13	11	51	10.2	4.8
HEMIPTERA	13	2	0	15	19	49	9.8	8.3
Notonecta (Paranecta) undulata	12	2	0	2	15	31	6.2	6.8
Sigara (Phaeo.) macropala	1	0	0	13	4	18	3.6	5.5
TRICHOPTERA	5	3	14	39	7	68	13.6	14.8
Banksiola smithi	3	2	1	22	2	30	6.0	9.0
Nectopsyche sp.1	0	0	0	6	0	6	1.2	2.7
Oecetis sp.1	1	0	3	3	4	11	2.2	1.6
Oecetis sp.2	1	0	0	1	1	3	0.6	0.5
Oxyethira sp.1	0	0	0	2	0	2	0.4	0.9
Platycentropus sp.	0	1	1	0	0	2	0.4	0.5
Polycentropus sp.1	0	0	0	2	0	2	0.4	0.9
Ptilostomis cf. ocellifera	0	0	1	1	0	2	0.4	0.5
Pycnopsyche sp(p)	0	0	8	2	0	10	2.0	3.5
COLEOPTERA	2	9	0	13	13	37	7.4	6.1
Coptotomus longulus	0	0	0	0	1	1	0.2	0.4
Dineutus nigrior	0	1	0	8	0	9	1.8	3.5
Gyrinus affinis	0	0	0	1	1	2	0.4	0.5
Gyrinus pectoralis	2	8	0	3	9	22	4.4	3.9
Hydroporus (Neoporus) undulatus	0	0	0	1	2	3	0.6	0.9
DIPTERA TOTAL	329	226	386	753	315	2009	401.8	204.5
DIPTERA:Ceratopogonidae	34	37	19	105	40	235	47.0	33.4
Bezzia sp.1	19	16	14	36	20	105	21.0	8.7
Bezzia sp.2/2A	11	10	2	42	16	81	16.2	15.3
Bezzia sp.3	4	9	1	14	3	31	6.2	5.3
Bezzia sp.4	0	1	1	3	0	5	1.0	1.2
Monohelea sp.	0	1	0	5	1	7	1.4	2.1
Probezzia sp.1	0	0	1	3	0	4	0.8	1.3

TAXONOMIC NAME	SITE 1	2	3	4	5	TOTAL	MEAN	STD
DIPTERA:Chironomidae	294	189	367	640	274	1764	352.8	172.6
Subfam.-Tanypodinae	71	57	46	32	39	245	49.0	15.4
Ablabesmyia (s.str.) monilis	0	0	1	1	1	3	0.6	0.5
Clinotanypus (s.str.) pinguis	1	0	0	0	0	1	0.2	0.4
Conchapelopia sp.	1	1	0	1	3	6	1.2	1.1
Natarsia baltimoreus	0	1	0	12	0	13	2.6	5.3
Procladius (Holotanypus) sp.	69	55	45	18	35	222	44.4	19.4
Subfam.-Orthocladiinae	5	4	3	36	11	59	11.8	13.9
Psectrocladius (Mono.) cf. calcaratus	0	0	0	2	2	4	0.8	1.1
Psectrocladius (s.str.) litofilus	1	3	0	3	0	7	1.4	1.5
Stackelbergina n.sp.	3	1	0	25	7	36	7.2	10.3
Zalutschia obsepta	1	0	1	4	1	7	1.4	1.5
Zalutschia sp.1	0	0	2	2	1	5	1.0	1.0
Subfam.-Chironominae	218	128	318	572	224	1460	292.0	170.3
Tribe-Chironomini	197	123	302	506	218	1346	269.2	146.9
Chironomus (s.str.) spp.	16	4	85	21	26	152	30.4	31.6
Cladopelma sp.	4	0	1	1	1	7	1.4	1.5
Cryptochironomus conus	5	6	1	8	9	29	5.8	3.1
Cryptochironomus spp.	0	1	0	1	1	3	0.6	0.5
Dicrotendipes leucoscelis	6	5	18	27	30	86	17.2	11.6
Dicrotendipes modestus	2	4	24	21	5	56	11.2	10.4
Dicrotendipes tritomus	0	0	0	18	2	20	4.0	7.9
Endochironomus nigricans	6	2	1	8	5	22	4.4	2.9
Glyptotendipes sp.2 gr."A"	2	0	0	0	0	2	0.4	0.9
Lauterborniella agrayloides	0	0	3	0	0	3	0.6	1.3
Microtendipes pedellus	4	4	19	50	2	79	15.8	20.3
Nilothauma babiyi	0	0	6	1	0	7	1.4	2.6
Pagastiella ostansa	8	10	0	6	1	25	5.0	4.4
Paratendipes cf. nudisquama	0	0	0	4	0	4	0.8	1.8
Polypedilum (s.lat.) sp.1	2	0	1	0	0	3	0.6	0.9
Polypedilum (s.lat.) sp.3	3	0	22	63	10	98	19.6	25.7
Polypedilum (Tripodura) simulans	4	3	8	0	1	16	3.2	3.1
Pseudochironomus sp. 3	27	13	1	253	100	394	78.8	104.7
Stenochironomus hilaris	0	0	0	2	0	2	0.4	0.9
Tribelos jucundum	108	71	112	22	25	338	67.6	43.3
Tribe-Tanytarsini	21	5	16	66	6	114	22.8	25.1
Cladotanytarsus spp.	0	1	2	1	0	4	0.8	0.8
Tanytarsus sp. 'Pc-brush'	2	0	0	1	0	3	0.6	0.9
Tanytarsus/Micropsectra spp.	19	4	14	64	6	107	21.4	24.6
DIPTERA:Tabanidae	0	0	0	7	1	8	1.6	3.0
Chrysops sp(p).	0	0	0	7	1	8	1.6	3.0
DIPTERA:Chaoboridae	1	0	0	0	0	1	0.2	0.4
Chaoborus (s.str.) americanus	1	0	0	0	0	1	0.2	0.4
DIPTERA:Misc.	0	0	0	1	0	1	0.2	0.4
Dolichopodidae: ?Rhaphium sp.	0	0	0	1	0	1	0.2	0.4
PELECYPODA	9	5	5	1	0	20	4.0	3.6
Pisidium casertanum	9	5	5	1	0	20	4.0	3.6

HUNTER'S LAKE OCT 18 1988

TAXONOMIC NAME			SITE			TOTAL	MEAN	STD
	1	2	3	4	5			
	sub	sub	sub	sub	sub			
NEMATODA	1	0	0	5	0	6	1.2	2.2
Anatonchus sp.	1	0	0	5	0	6	1.2	2.2
OLIGOCHAETA	1	3	0	1	1	6	1.2	1.1
Enchytraeidae	0	1	0	0	0	1	0.2	0.4
Lumbriculus variegatus	1	2	0	1	0	4	0.8	0.8
Tubificidae + hairs	0	0	0	0	1	1	0.2	0.4
AMPHIPODA	0	1	0	2	0	3	0.6	0.9
Crangonyx laurentianus	0	1	0	1	0	2	0.4	0.5
Hyalella azteca	0	0	0	1	0	1	0.2	0.4
HYDRACARINA	0	1	0	0	1	2	0.4	0.5
Arrenurus (Mega.) bergei	0	0	0	0	1	1	0.2	0.4
Limnochares americana	0	1	0	0	0	1	0.2	0.4
EPHEMEROPTERA	91	45	28	304	99	567	113.4	110.7
Caenis diminuta	7	9	4	13	1	34	6.8	4.6
Eurylophella temporalis	37	4	2	54	4	101	20.2	23.9
Leptophlebia cupida	47	32	22	237	94	432	86.4	88.6
ODONATA	236	92	51	108	449	936	187.2	161.9
Aeshna umbrosa	0	0	0	1	2	3	0.6	0.9
Cordulia shurtleffi	90	31	12	19	45	197	39.4	30.9
Epitheca cynosura	11	5	0	5	9	30	6.0	4.2
Gomphus exilis	12	3	4	19	30	68	13.6	11.2
Ischnura verticalis	107	30	19	54	311	521	104.2	120.5
Leucorrhinia frigida	0	0	0	0	3	3	0.6	1.3
Leucorrhinia hudsonica	7	6	10	7	33	63	12.6	11.5
Libellula julia	9	17	6	3	16	51	10.2	6.1
HEMIPTERA	2	3	2	1	0	8	1.6	1.1
Belostoma flumineum	1	0	0	0	0	1	0.2	0.4
Notonecta (Paranecta) undulata	1	2	1	0	0	4	0.8	0.8
Sigara (Phaeo.) mackinacensis	1	1	1	1	0	4	0.8	0.4
MEGALOPTERA	28	12	3	37	13	93	18.6	13.6
Sialis sp.	28	12	3	37	13	93	18.6	13.6
TRICHOPTERA	8	6	13	37	20	84	16.8	12.5
Agrypnia improba	0	0	0	0	1	1	0.2	0.4
Agrypnia vestita	0	0	0	0	1	1	0.2	0.4
Banksiola smithi	0	0	1	0	0	1	0.2	0.4
Nectopsyche sp.1	1	0	0	5	2	8	1.6	2.1
Oecetis sp.1	0	0	1	3	2	6	1.2	1.3
Oecetis sp.2	1	2	1	14	8	26	5.2	5.7
Oxyethira sp.1	1	0	2	7	2	12	2.4	2.7
Oxyethira sp.4	0	0	0	1	0	1	0.2	0.4
Platycentropus sp.	0	0	2	0	1	3	0.6	0.9
Polycentropus sp.2	4	3	6	7	3	23	4.6	1.8
Triaenodes sp.1	1	1	0	0	0	2	0.4	0.5
LEPIDOPTERA	5	0	0	0	0	5	1.0	2.2
Eoparargyractis sp.	5	0	0	0	0	5	1.0	2.2

TAXONOMIC NAME			SITE			TOTAL	MEAN	STD
	1	2	3	4	5			
	sub	sub	sub	sub	sub			
DIPTERA	1177	1570	1311	5961	2518	12536.4	2507.3	2000.5
DIPTERA:Ceratopogonidae	34	57	19	77	60	247	49.4	22.9
Bezzia sp.1	22	27	12	49	41	151	30.2	14.8
Bezzia sp.1A	0	20	1	11	1	33	6.6	8.7
Bezzia sp.2/2A	12	9	6	7	4	38	7.6	3.0
Bezzia sp.3	0	0	0	2	3	5	1.0	1.4
Probezzia sp.4	0	1	0	8	11	20	4.0	5.1
DIPTERA:Chironomidae	1143	1513	1292	5884	2458	12289.4	2457.9	1982.4
Subfam.-Tanypodinae	229	182	116	647	197	1370.2	274.0	212.6
Ablabesmyia (s.str.) monilis	11	30	0	412	0	453.5	90.7	180.0
Conchapelopia sp.	11	0	0	0	0	11.4	2.3	5.1
Procladius (Holotanypus) sp.	206	151	116	235	197	905.3	181.1	47.1
Subfam.-Orthocladiinae	11	197	181	1530	639	2557.8	511.6	614.8
Psectrocladius (Mono.) cf. calcaratus	0	0	13	59	0	71.7	14.3	25.5
Psectrocladius (s.str.) litofilus	11	15	0	177	0	203	40.6	76.3
Stackelbergina n.sp.	0	30	0	118	0	147.9	29.6	51.0
Zalutschia obsepta	0	151	168	1177	639	2135.2	427.0	482.8
Subfam.-Chironominae	903	1135	995	3707	1622	8361.4	1672.3	1170.7
Tribe-Chironomini	903	1120	982	3707	1622	8333.4	1666.7	1174.3
Chironomus (s.str.) spp.	0	15	13	0	0	28	5.6	7.7
Cryptochironomus conus	0	0	0	0	25	24.6	4.9	11.0
Dicrotendipes leucuscelis	0	0	0	0	25	24.6	4.9	11.0
Dicrotendipes modestus	194	575	594	2942	1180	5485.3	1097.1	1089.8
Dicrotendipes tritomus	69	30	13	294	49	455.1	91.0	115.5
Microtendipes pedellus	549	484	284	118	221	1655.9	331.2	180.7
Polypedilum (s.lat.) sp.3	0	0	13	0	0	12.9	2.6	5.8
Pseudochironomus sp. 1	46	0	0	353	74	472.4	94.5	147.9
Stenochironomus hilaris	11	0	0	0	0	11.4	2.3	5.1
Stictochironomus sp.1/3	23	0	52	0	49	123.8	24.8	25.3
Tribelos jucundum	11	15	13	0	0	39.4	7.9	7.3
Tribe-Tanytarsini	0	15	13	0	0	28	5.6	7.7
Tanytarsus/Micropsectra spp.	0	15	13	0	0	28	5.6	7.7
PELECYPODA	0	2	0	0	2	4	0.8	1.1
Pisidium casertanum	0	2	0	0	2	4	0.8	1.1

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TAXONOMIC NAME			SITE			TOTAL	MEAN	STD
	1	2	3 sub	4	5			
OLIGOCHAETA	7	14	10	1	7	39	7.8	4.8
Enchytraeidae	0	2	3	0	0	5	1.0	1.4
Lumbriculus variegatus	7	12	5	1	6	31	6.2	4.0
Tubificidae - hairs	0	0	2	0	1	3	0.6	0.9
HIRUDINEA	4	4	3	1	0	12	2.4	1.8
Placobdella picta	1	0	0	0	0	1	0.2	0.4
Helobdella stagnalis	0	2	0	1	0	3	0.6	0.9
Nephelopsis obscura	3	2	3	0	0	8	1.6	1.5
AMPHIPODA	41	229	60	6	85	421	84.2	85.9
Crangonyx laurentianus	30	22	30	6	2	90	18.0	13.3
Hyalella azteca	11	207	30	0	83	331	66.2	84.9
DECAPODA	0	0	0	1	0	1	0.2	0.4
Cambarus (P.) robustus	0	0	0	1	0	1	0.2	0.4
HYDRACARINA	0	0	0	1	0	1	0.2	0.4
Unionicola crassipes laurentiana	0	0	0	1	0	1	0.2	0.4
EPHEMEROPTERA	120	181	441	217	340	1299	259.8	129.3
Caenis diminuta	16	26	51	9	105	207	41.4	39.0
Eurylophella temporalis	79	128	373	185	202	967	193.4	111.5
Leptophlebia cupida	25	27	17	22	33	124	24.8	5.9
Stenonema (s.str.) femoratum	0	0	0	1	0	1	0.2	0.4
ODONATA	11	14	19	4	20	68	13.6	6.5
Aeshna eremita	1	1	0	0	0	2	0.4	0.5
Chromagrion conditum	0	0	1	0	0	1	0.2	0.4
Cordulia shurtleffi	6	5	14	1	11	37	7.4	5.1

TAXONOMIC NAME			SITE			TOTAL	MEAN	STD
	1	2	3 sub	4	5			
ODONATA cond't.								
Gomphus exilis	0	1	1	1	1	4	0.8	0.4
Ischnura verticalis	1	0	0	0	0	1	0.2	0.4
Leucorrhinia hudsonica	0	7	0	0	5	12	2.4	3.4
Libellula julia	3	0	2	2	2	9	1.8	1.1
Somatochlora williamsoni	0	0	1	0	1	2	0.4	0.5
HEMIPTERA	2	3	0	2	0	7	1.4	1.3
Notonecta (Paranecta) undulata	0	2	0	0	0	2	0.4	0.9
Sigara (Phaeo.) macropala	1	1	0	2	0	4	0.8	0.8
Sigara (Vermi.) mullettensis	1	0	0	0	0	1	0.2	0.4
TRICHOPTERA	36	32	25	15	10	118	23.6	11.0
Banksiola crotchi	2	3	4	1	0	10	2.0	1.6
Banksiola smithi	0	3	0	0	1	4	0.8	1.3
Molanna ulmerina-uniophila	0	0	0	0	3	3	0.6	1.3
Nectopsyche sp.1	18	14	9	8	4	53	10.6	5.5
Nemotaulius hostilis	0	0	2	0	0	2	0.4	0.9
Oecetis sp.1	0	1	1	0	1	3	0.6	0.5
Oecetis sp.2	0	4	1	1	0	6	1.2	1.6
Oxyethira sp.1	1	1	2	1	0	5	1.0	0.7
Oxyethira sp.2	0	0	0	1	0	1	0.2	0.4
Oxyethira sp.4	0	0	0	1	0	1	0.2	0.4
Platycentropus sp.	3	1	1	1	1	7	1.4	0.9
Polycentropus sp.1	0	1	0	0	0	1	0.2	0.4
Polycentropus sp.2	0	0	0	1	0	1	0.2	0.4
Pycnopsyche sp(p)	9	2	0	0	0	11	2.2	3.9
Triaenodes sp.1	3	2	5	0	0	10	2.0	2.1
COLEOPTERA	0	0	4	0	0	4	0.8	1.8
Gyrinus pectoralis	0	0	4	0	0	4	0.8	1.8

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TAXONOMIC NAME	SITE 1	2	3 sub	4	5	TOTAL	MEAN	STD
DIPTERA	252	835	1191.2	409	333	3020.2	604.0	398.0
DIPTERA:Ceratopogonidae	20	90	141	99	89	439	87.8	43.5
Bezzia sp.1	6	35	67	91	28	227	45.4	33.6
Bezzia sp.2/2A	2	10	18	4	12	46	9.2 6.4	
Bezzia sp.3	11	18	47	2	21	99	19.8	16.9
Bezzia sp.4	1	24	0	0	27	52	10.4	13.8
Monohelea sp.	0	3	4	0	1	8	1.6	1.8
Probezzia sp.1	0	0	0	2	0	2	0.4	0.9
DIPTERA:Chironomidae	231	744	1049.2	303	244	2571.2	514.2	366.3
Subfam.-Tanypodinae	50	79	126	36	49	340	68.0	36.0
Ablabesmyia (s.str.) aspera	0	3	0	0	6	9	1.8	2.7
Ablabesmyia (s.str.) mallochi	1	14	0	15	4	34	6.8	7.2
Ablabesmyia (s.str.) monilis	0	0	42	2	3	47	9.4	18.3
Clinotanypus (s.str.) pinguis	1	15	10.5	0	0	26.5	5.3	7.0
Conchapelopia sp.	3	0	31.5	3	1	38.5	7.7	13.4
Natarsia baltimoreus	2	0	0	0	1	3	0.6	0.9
Procladius (Holotanypus) sp.	43	47	42	14	33	179	35.8	13.2
Zavrelimyia sp.	0	0	0	2	1	3	0.6	0.9
Subfam.-Orthocladiinae	21	245	157.3	29	23	475.3	95.1	101.7
Cricotopus (Iso.) sp. laricomalis gr.	0	1	0	0	0	1	0.2	0.4
Heterotrissocladius changi	1	7	0	0	2	10	2.0	2.9
Psectrocladius (Mono.) cf. calcaratus	13	99	62.9	1	5	180.9	36.2	43.0
Psectrocladius (s.str.) litofilus	4	50	73.4	16	9	152.4	30.5	30.0
Psectrocladius (s.str.) simulans	1	3	0	0	0	4	0.8 1.3	
Stackelbergina n.sp.	0	2	0	1	3	6	1.2 1.3	
Zalutschia obsepta	1	72	21	3	3	100	20.0	30.2
Zalutschia sp.1	1	11	0	8	1	21	4.2 5.0	

TAXONOMIC NAME	SITE 1	2	3 sub	4	5	TOTAL	MEAN	STD
DIPTERA:Chironomidae cond't								
Subfam.-Chironominae	160	420	765.9	238	172	1755.9	351.2	254.1
Tribe-Chironomini	142	271	682	200	138	1433	286.6	227.5
Chironomus (s.str.) spp.	3	2	0	11	1	17	3.4	4.4
Cryptochironomus conus	8	7	10.5	7	5	37.5	7.5	2.0
Dicrotendipes leucoscelis	0	3	10.5	3	1	17.5	3.5	4.1
Dicrotendipes modestus	9	78	367.2	10	29	493.2	98.6	152.7
Dicrotendipes tritomus	10	49	31.5	3	19	112.5	22.5	18.2
Endochironomus nigricans	10	10	10.5	8	7	45.5	9.1	1.5
Microtendipes pedellus	45	90	220.3	33	51	439.3	87.9	77.1
Nilothauma babiyi	1	1	0	1	1	4	0.8	0.4
Phaenopsectra sp.	0	2	0	0	0	2	0.4	0.9
Polypedilum (s.lat.) sp.3	0	2	10.5	0	1	13.5	2.7	4.4
Polypedilum (Tripodura) simulans	5	10	0	0	0	15	3.0	4.5
Pseudochironomus articaudus	1	0	0	0	0	1	0.2	0.4
Pseudochironomus sp. 3	29	9	0	2	17	57	11.4	11.9
Stenochironomus hilaris	1	3	10.5	2	0	16.5	3.3	4.2
Stictochironomus sp.1/3	0	2	0	0	2	4	0.8	1.1
Tribelos jucundum	20	3	10.5	120	4	157.5	31.5	49.9
Tribe-Tanytarsini	18	149	83.9	38	34	322.9	64.6	53.2
Cladotanytarsus spp.	1	92	10.5	3	1	107.5	21.5	39.6
Paratanytarsus spp.	0	3	0	1	0	4	0.8	1.3
Tanytarsus sp. 'Pc-brush'	0	0	0	5	8	13	2.6	3.7
Tanytarsus/Micropsectra spp.	17	54	73.4	29	25	198.4	39.7	23.4
DIPTERA:Tabanidae	1	1	1	0	0	3	0.6	0.5
Chrysops ater	0	0	1	0	0	1	0.2	0.4
Chrysops ?excitans	1	0	0	0	0	1	0.2	0.4
Chrysops sp(p).	0	1	0	0	0	1	0.2	0.4
DIPTERA:Misc.	0	0	0	7	0	7	1.4	3.1
Empididae:Hemerodromia sp.	0	0	0	7	0	7	1.4	3.1
PELECYPODA	4	1	2	10	2	19	3.8	3.6
Pisidium casertanum	4	1	0	10	2	17	3.4	4.0
Pisidium nitidum	0	0	2	0	0	2	0.4	0.9

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TAXONOMIC NAME	SITE 1	 2 sub	 3	 4	 5	TOTAL	MEAN	STD
OLIGOCHAETA	1	2	0	0	1	4	0.8	0.8
Lumbriculus variegatus	1	1	0	0	1	3	0.6	0.5
Nais simplex	0	1	0	0	0	1	0.2	0.4
HIRUDINEA	1	0	1	0	0	2	0.4	0.5
Nephelopsis obscura	1	0	1	0	0	2	0.4	0.5
AMPHIPODA	196	177	161	333	491	1358	271.6	140.4
Crangonyx laurentianus	196	177	161	333	491	1358	271.6	140.4
EPHEMEROPTERA	17	163	35	183	74	472	94.4	75.0
Eurylophella temporalis	0	0	3	4	2	9	1.8	1.8
Leptophlebia cupida	17	163	32	179	72	463	92.6	74.6
ODONATA	77	165	35	51	32	360	72.0	55.0
Aeshna eremita	0	0	0	0	1	1	0.2	0.4
Aeshna umbrosa	0	0	1	2	4	7	1.4	1.7
Chromagrion conditum	1	3	0	0	0	4	0.8	1.3
Cordulia shurtleffi	50	100	24	25	11	210	42.0	35.4
Enallagma boreale	6	34	1	18	10	69	13.8	12.9
Ischnura verticalis	2	0	0	3	0	5	1.0	1.4
Lestes disjunctus	1	3	0	0	0	4	0.8	1.3
Leucorrhinia frigida	3	1	0	0	0	4	0.8	1.3
Leucorrhinia hudsonica	7	9	4	2	5	27	5.4	2.7
Libellula incesta	4	0	0	0	0	4	0.8	1.8
Libellula julia	3	15	5	1	1	25	5.0	5.8
HEMIPTERA	23	62	6	14	7	112	22.4	23.2
Cenocorixa n.sp.	0	1	0	0	0	1	0.2	0.4
Hesperocorixa atopodonta	0	0	0	1	0	1	0.2	0.4
Hesperocorixa michiganensis	2	0	0	1	0	3	0.6	0.9
Hesperocorixa vulgaris	1	1	2	1	0	5	1.0	0.7
Notonecta (Paranecta) insulata	2	6	0	1	0	9	1.8	2.5
Notonecta (Paranecta) undulata	18	8	0	10	7	43	8.6	6.5
Sigara (Arcto.) penniensis	0	3	0	0	0	3	0.6	1.3
Sigara (Phaeo.) compressoidea	0	0	1	0	0	1	0.2	0.4
Sigara (Phaeo.) macropala	0	41	2	0	0	43	8.6	18.1
Sigara (Vermi.) deflecta	0	2	1	0	0	3	0.6	0.9

TAXONOMIC NAME	SITE 1	 2 sub	 3	 4	 5	TOTAL	MEAN	STD
MEGALOPTERA	0	0	0	0	1	1	0.2	0.4
Chauliodes sp.	0	0	0	0	1	1	0.2	0.4
TRICHOPTERA	29	119	36	67	33	284	56.8	37.9
Agrypnia improba	0	1	0	0	0	1	0.2	0.4
Banksiola crotchi	5	20	2	4	10	41	8.2	7.2
Banksiola smithi	6	65	16	19	15	121	24.2	23.3
Nectopsyche sp.1	0	0	0	1	0	1	0.2	0.4
Nemotaulius hostilis	1	1	0	0	0	2	0.4	0.5
Oecetis sp.1	0	3	0	1	0	4	0.8	1.3
Platycentropus sp.	17	7	5	26	3	58	11.6	9.7
Polycentropus sp.1	0	21	13	14	5	53	10.6	8.2
Ptilostomis cf. ocellifera	0	1	0	0	0	1	0.2	0.4
Triaenodes sp.1	0	0	0	2	0	2	0.4	0.9
LEPIDOPTERA	1	1	0	0	1	3	0.6	0.5
Acentria sp.2	0	1	0	0	0	1	0.2	0.4
Acentria sp.3	1	0	0	0	1	2	0.4	0.5
COLEOPTERA	26	22	1	53	39	141	28.2	19.5
Agabus sp. ELA	0	0	0	4	0	4	0.8	1.8
Coptotomus longulus	21	20	1	9	25	76	15.2	9.9
Dineutus nigrior	2	1	0	0	0	3	0.6	0.9
Gyrinus affinis	0	0	0	1	0	1	0.2	0.4
Gyrinus pectoralis	1	0	0	27	12	40	8.0	11.8
Gyrinus sayi (=lugens)	0	0	0	1	0	1	0.2	0.4
Haliplus pantherinus	1	0	0	0	0	1	0.2	0.4
Hydroporus (Neoporus) undulatus	0	1	0	6	1	8	1.6	2.5
Laccophilus maculosus	0	0	0	5	0	5	1.0	2.2
Tropisternus mixtus	1	0	0	0	1	2	0.4	0.5

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TAXONOMIC NAME			SITE			TOTAL	MEAN	STD
	1	2 sub	3	4	5			
DIPTERA	427	1348.8	99	393	109	2377	475.4	511.8
DIPTERA:Ceratopogonidae	26	90	13	21	8	158	31.6	33.4
Bezzia sp.1	14	34	2	11	2	63	12.6	13.1
Bezzia sp.1A	2	19	0	7	0	28	5.6	8.0
Bezzia sp.2/2A	3	15	8	1	5	32	6.4	5.5
Bezzia sp.3	5	22	3	2	1	33	6.6	8.7
Bezzia sp.5	2	0	0	0	0	2	0.4	0.9
DIPTERA:Chironomidae	400	1253.8	85	372	101	2212	442.4	476.8
Subfam.-Tanypodinae	18	275.8	28	26	6	354	70.8	114.9
Ablabesmyia (s.str.) monilis	3	12.5	0	1	0	17	3.3	5.3
Ablabesmyia (Karelia) illinoensis	0	12.5	1	2	0	16	3.1	5.3
Natarsia baltimoreus	0	0	9	6	1	16	3.2	4.1
Procladius (Holotanypus) sp.	15	250.8	18	17	5	306	61.2	106.1
Subfam.-Orthocladiinae	50	338.6	10	156	27	582	116.3	136.6
Psectrocladius (Mono.) cf. calcaratus	2	25.1	0	2	0	29	5.8	10.8
Psectrocladius (s.str.) litofilus	41	301	9	113	17	481	96.2	121.6
Psectrocladius (s.str.) simulans	1	0	0	22	1	24	4.8	9.6
Stackelbergina n.sp.	6	0	1	19	9	35	7.0	7.6
Zalutschia sp.1	0	12.5	0	0	0	13	2.5	5.6
Subfam.-Chironominae	332	639.4	47	190	68	1276	255.3	243.0
Tribe-Chironomini	299	539.1	46	169	60	1113	222.6	204.0
Chironomus (s.str.) spp.	100	62.7	13	48	13	237	47.3	36.6
Cladopelma sp.	0	12.5	0	0	0	13	2.5	5.6
Cryptochironomus conus	0	12.5	0	2	1	16	3.1	5.3
Dicrotendipes modestus	104	150.5	1	26	8	290	57.9	66.0
Dicrotendipes tritomus	2	25.1	0	1	0	28	5.6	10.9
Endochironomus nigricans	19	25.1	5	55	9	113	22.6	19.8
Kiefferulus dux	0	0	0	0	1	1	0.2	0.4
Microtendipes pedellus	6	163	16	19	3	207	41.4	68.3
Omisus ?caledonicus	14	0	0	3	13	30	6.0	7.0
Pagastiella ostansa	4	50.2	0	0	0	54	10.8	22.1
Phaenopsectra sp.	0	0	0	3	0	3	0.6	1.3
Polypedilum (Pentapedilum) tritum	1	12.5	0	0	0	14	2.7	5.5
Polypedilum (s.lat.) sp.1	0	0	0	1	0	1	0.2	0.4
Polypedilum (s.lat.) sp.3	44	0	0	7	3	54	10.8	18.8
Polypedilum (Tripodura) simulans	0	12.5	1	0	0	14	2.7	5.5
Stenochironomus hilaris	0	0	0	0	2	2	0.4	0.9
Tribelos jucundum	5	12.5	10	4	7	39	7.7	3.5
Tribe-Tanytarsini	33	100.3	1	21	8	163	32.7	39.8
Paratanytarsus spp.	12	0	0	2	0	14	2.8	5.2
Tanytarsus/Micropsectra spp.	21	100.3	1	19	8	149	29.9	40.2

TAXONOMIC NAME			SITE			TOTAL	MEAN	STD
	1	2 sub	3	4	5			
DIPTERA:Tabanidae	0	5	1	0	0	6	1.2	2.2
Chrysops ?excitans	0	5	1	0	0	6	1.2	2.2
DIPTERA:Culicidae	1	0	0	0	0	1	0.2	0.4
Mansonia perturbans	1	0	0	0	0	1	0.2	0.4
DIPTERA:Misc.	0	1	0	2	0	3	0.6	0.9
Empididae:Hemerodromia sp.	0	1	0	2	0	3	0.6	0.9
PELECYPODA	0	0	3	6	4	13	2.6	2.6
Pisidium casertanum	0	0	3	6	4	13	2.6	2.6

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TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4 sub	5			
OLIGOCHAETA	1	1	2	2	0	6	1.2	0.8
Enchytraeidae	0	0	1	0	0	1	0.2	0.4
Lumbriculus variegatus	1	0	1	2	0	4	0.8	0.8
Tubificidae + hairs	0	1	0	0	0	1	0.2	0.4
HIRUDINEA	1	0	0	3	0	4	0.8	1.3
Erpobdella punctata	0	0	0	3	0	3	0.6	1.3
Nephelopsis obscura	1	0	0	0	0	1	0.2	0.4
AMPHIPODA	40	17	22	25	4	108	21.6	13.0
Crangonyx laurentianus	40	17	22	25	4	108	21.6	13.0
EPHEMEROPTERA	135	238	176	404	547	1500	300.0	171.9
Eurylophella temporalis	5	0	41	18	106	170	34.0	43.3
Leptophlebia cupida	130	238	135	386	441	1330	266.0	142.7
ODONATA	45	51	3	34	3	136	27.2	22.9
Aeshna eremita	1	0	1	2	0	4	0.8	0.8
Aeshna umbrosa	1	0	1	0	1	3	0.6	0.5
Chromagrion conditum	9	1	0	0	0	10	2.0	3.9
Cordulia shurtleffi	18	43	1	5	1	68	13.6	17.9
Enallagma boreale	6	0	0	1	0	7	1.4	2.6
Enallagma hageni	1	0	0	7	1	9	1.8	2.9
Epitheca cynosura	0	0	0	2	0	2	0.4	0.9
Leucorrhinia hudsonica	5	4	0	0	0	9	1.8	2.5
Libellula julia	4	3	0	17	0	24	4.8	7.0
HEMIPTERA	2	12	19	159	15	207	41.4	66.0
Buenoa macrotibialis	0	1	2	141	2	146	29.2	62.5
Notonecta (Paranecta) undulata	1	7	1	1	1	11	2.2	2.7
Sigara (Arcto.) decoratella	0	0	0	1	2	3	0.6	0.9
Sigara (Phaeo.) macropala	1	4	6	1	6	18	3.6	2.5
Sigara (Vermi.) deflecta	0	0	10	15	4	29	5.8	6.6
MEGALOPTERA	0	0	1	0	0	1	0.20	0.4
Chauliodes sp.	0	0	1	0	0	1	0.20	0.4
TRICHOPTERA	39	136	30	55	13	273	54.60	48.0
Banksiola crotchi	4	3	0	0	0	7	1.40	1.9
Banksiola smithi	0	20	1	1	0	22	4.40	8.7
Lype diversa	0	0	0	1	0	1	0.20	0.4
Molanna ulmerina-uniophila	1	0	0	12	0	13	2.60	5.3
Nectopsyche sp.1	0	0	0	2	0	2	0.40	0.9
Nyctiophylax affinis	0	0	0	0	1	1	0.20	0.4
Oecetis sp.1	0	0	0	7	0	7	1.40	3.1
Oecetis sp.2	0	0	0	2	0	2	0.40	0.9
Platycentropus sp.	18	30	8	4	0	60	12.00	12.1
Polycentropus sp.1	4	80	9	13	7	113	22.60	32.3
Polycentropus sp.2	0	0	0	5	1	6	1.20	2.2
Ptilostomis cf. ocellifera	6	2	1	2	1	12	2.40	2.1
Pycnopsyche sp(p)	6	1	11	6	3	27	5.40	3.8
LEPIDOPTERA	0	1	0	0	0	1	0.20	0.4
Acentria sp.2	0	1	0	0	0	1	0.20	0.4
COLEOPTERA	0	1	70	0	0	71	14.20	31.2
Agabus sp. ELA	0	1	0	0	0	1	0.20	0.4
Dineutus nigrior	0	0	4	0	0	4	0.80	1.8
Gyrinus aeratus	0	0	2	0	0	2	0.40	0.9
Gyrinus affinis	0	0	3	0	0	3	0.60	1.3
Gyrinus pectoralis	0	0	59	0	0	59	11.80	26.4
Gyrinus sayi (=lugens)	0	0	2	0	0	2	0.40	0.9

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TAXONOMIC NAME			SITE			TOTAL	MEAN	STD
	1	2	3	4 sub	5			
DIPTERA	308	578	76	1611.9	86	2660	532.0	637.4
DIPTERA:Ceratopogonidae	9	9	2	37	1	58	11.6	14.7
Bezzia sp.1	9	8	2	33	1	53	10.6	13.0
Bezzia sp.2/2A	0	0	0	1	0	1	0.2	0.4
Bezzia sp.3	0	0	0	2	0	2	0.4	0.9
Dasyhelea sp.1 (pale head)	0	1	0	0	0	1	0.2	0.4
Probezzia sp.1	0	0	0	1	0	1	0.2	0.4
DIPTERA:Chironomidae	299	565	72	1573.9	85	2595	519.0	622.8
Subfam.-Tanypodinae	28	89	3	15.7	5	141	28.1	35.4
Ablabesmyia (s.str.) mallochi	1	0	0	0	1	2	0.4	0.5
Ablabesmyia (s.str.) monilis	0	2	0	0	0	2	0.4	0.9
Conchapelopia sp.	3	5	0	15.7	0	24	4.7	6.5
Natarsia baltimoreus	0	1	1	0	0	2	0.4	0.5
Procladius (Holotanypus) sp.	24	79	0	0	3	106	21.2	33.8
Zavrelimyia sp.	0	2	2	0	1	5	1.0	1.0
Subfam.-Orthocladiinae	27	120	32	15.7	22	217	43.3	43.3
Limnophyes sp.	0	2	3	0	1	6	1.2	1.3
Parametriocnemus lundbecki	0	0	4	0	0	4	0.8	1.8
Psectrocladius (Allops.) pilosus	0	0	0	0	1	1	0.2	0.4
Psectrocladius (Mono.) cf. calcaratus	0	1	0	0	0	1	0.2	0.4
Psectrocladius (s.str.) litofilus	24	111	18	15.7	20	189	37.7	41.1
Psectrocladius (s.str.) simulans	1	3	1	0	0	5	1.0	1.2
Pseudorthocladius sp.	0	2	6	0	0	8	1.6	2.6
Pseudosmittia sp.2	0	1	0	0	0	1	0.2	0.4
Stackelbergina n.sp.	2	0	0	0	0	2	0.4	0.9

TAXONOMIC NAME			SITE			TOTAL	MEAN	STD
	1	2	3	4 sub	5			
DIPTERA:Chironomidae cond't.								
Subfam.-Chironominae	244	356	37	1542.5	58	2238	447.5	626.3
Tribe-Chironomini	232	270	33	1495.3	45	2075	415.1	613.2
Chironomus (s.str.) spp.	14	74	1	15.7	0	105	20.9	30.5
Cryptochironomus conus	2	2	1	31.5	1	38	7.5	13.4
Dicrotendipes leucoscelis	0	1	1	0	0	2	0.4	0.5
Dicrotendipes modestus	5	21	0	31.5	3	61	12.1	13.6
Dicrotendipes tritomus	0	25	0	0	2	27	5.4	11.0
Endochironomus nigricans	11	11	0	0	7	29	5.8	5.5
Microtendipes pedellus	151	83	23	1290.7	14	1562	312.3	549.7
Omisus ?caledonicus	21	7	0	0	0	28	5.6	9.1
Phaenopsectra flavipes	0	0	0	0	2	2	0.4	0.9
Phaenopsectra sp.	16	11	2	0	0	29	5.8	7.3
Polypedilum (s.lat.) sp.1	0	10	0	0	5	15	3.0	4.5
Polypedilum (Tripodura) simulans	0	1	0	0	0	1	0.2	0.4
Pseudochironomus sp. 3	1	3	1	0	4	9	1.8	1.6
Stenochironomus hilaris	1	2	2	0	5	10	2.0	1.9
Stictochironomus sp.1/3	0	0	0	0	1	1	0.2	0.4
Tribelos jucundum	10	19	2	125.9	1	158	31.6	53.2
Tribe-Tanytarsini	12	86	4	47.2	13	162	32.4	34.2
Parapsectra sp.	1	0	0	0	0	1	0.2	0.4
Tanytarsus sp. 'Pc-brush'	0	1	0	0	0	1	0.2	0.4
Tanytarsus/Micropsectra spp.	11	85	4	47.2	13	160	32.0	34.0
DIPTERA:Tabanidae	0	2	0	0	0	2	0.4	0.9
Chrysops sp(p). indet.	0	2	0	0	0	2	0.4	0.9
DIPTERA:Chaoboridae	0	0	0	1	0	1	0.2	0.4
Chaoborus (s.str.) flavicans	0	0	0	1	0	1	0.2	0.4
DIPTERA:Misc.	0	2	2	1	0	5	1.0	1.0
Dolichopodidae: Rhaphium sp.	0	1	2	0	0	3	0.6	0.9
Empididae:Hemerodromia sp.	0	0	0	1	0	1	0.2	0.4
Phoridae	0	1	0	0	0	1	0.2	0.4
PELECYPODA	1	0	0	13	1	15	3.0	5.6
Pisidium casertanum	0	0	0	13	1	14	2.8	5.7
Pisidium lilljeborgi	1	0	0	0	0	1	0.2	0.4

TONAKELA LAKE OCT 19 1988 Page 1 of 2

TAXONOMIC NAME			SITE			TOTAL	MEAN	STD
	1	2	3	4	5			
	sub	sub	sub	sub				
NEMATODA	0	1	0	0	0	1	0.2	0.4
Mermithidae	0	1	0	0	0	1	0.2	0.4
OLIGOCHAETA	0	3	0	2	0	5	1.0	1.4
Lumbriculus variegatus	0	2	0	2	0	4	0.8	1.1
Tubificidae - hairs	0	1	0	0	0	1	0.2	0.4
AMPHIPODA	38	20	15	43	28	144	28.8	11.8
Crangonyx laurentianus	38	20	15	43	28	144	28.8	11.8
HYDRACARINA	1	0	1	1	4	7	1.4	1.5
Limnochares americana	1	0	1	1	4	7	1.4	1.5
EPHEMEROPTERA	18	13	5	4	5	45	9.0	6.2
Eurylophella temporalis	1	0	1	0	0	2	0.4	0.5
Leptophlebia cupida	17	13	4	4	5	43	8.6	6.0
ODONATA	85	232	254	123	151	845	169.0	71.9
Aeshna canadensis	0	0	1	0	0	1	0.2	0.4
Aeshna eremita	0	0	0	0	1	1	0.2	0.4
Cordulia shurtleffi	32	51	23	47	124	277	55.4	40.0
Enallagma boreale	2	5	4	0	3	14	2.8	1.9
Enallagma hageni		0	0	1	0	1	0.2	0.4
Leucorrhinia hudsonica	51	176	226	75	23	551	110.2	86.7
HEMIPTERA	5	3	2	1	1	12	2.4	1.7
Hesperocorixa vulgaris	0	1	0	0	0	1	0.2	0.4
Notonecta (Paranecta) undulata	5	2	2	0	1	10	2.0	1.9
Sigara (Phaeo.) macropala	0	0	0	1	0	1	0.2	0.4
TRICHOPTERA	102	53	39	12	22	228	45.6	35.2
Agrypnia improba	0	0	1	0	0	1	0.2	0.4
Agrypnia vestita	0	0	0	1	0	1	0.2	0.4
Banksiola crotchi	0	0	4	0	2	6	1.2	1.8
Banksiola dossuaria	0	0	0	1	0	1	0.2	0.4
Banksiola smithi	0	1	6	0	4	11	2.2	2.7
Oecetis sp.1	9	1	0	1	1	12	2.4	3.7
Oxyethira sp.1	2	9	2	1	0	14	2.8	3.6
Platycentropus sp.	0	0	0	0	1	1	0.2	0.4
Polycentropus sp.1	89	42	25	7	11	174	34.8	33.3
Ptilostomis cf. ocellifera	1	0	0	1	1	3	0.6	0.5
Pycnopsyche sp(p)	1	0	0	0	0	1	0.2	0.4
Triaenodes sp.1	0	0	1	0	2	3	0.6	0.9
LEPIDOPTERA	0	0	0	0	1	1	0.2	0.4
Crampus sp.2	0	0	0	0	1	1	0.2	0.4
COLEOPTERA	0	6	2	0	6	14	2.8	3.0
Agabus anthracinus	0	0	0	0	1	1	0.2	0.4
Dineutus nigrior	0	0	1	0	0	1	0.2	0.4
Graphoderus liberus	0	4	0	0	5	9	1.8	2.5
Gyrinus pectoralis	0	2	1	0	0	3	0.6	0.9

TONAKELA LAKE OCT 19 1988 Page 2 of 2

TAXONOMIC NAME	SITE					TOTAL	MEAN	STD
	1	2	3	4	5			
	sub	sub	sub	sub				
DIPTERA	358.1	797.1	920.5	462	408	2945.7	589.1	252.7
DIPTERA:Ceratopogonidae	12	41	84	40	9	186	37.2	30.2
Alluaudomyia sp.	0	0	1	0	0	1	0.2	0.4
Bezzia sp.1	2	36	67	29	8	142	28.4	25.8
Bezzia sp.1A	0	0	2	0	1	3	0.6	0.9
Bezzia sp.2/2A	9	5	11	3	0	28	5.6	4.4
Bezzia sp.3	0	0	1	0	0	1	0.2	0.4
Bezzia sp.8	0	0	2	0	0	2	0.4	0.9
Dasyhelea sp.1 (pale head)	0	0	0	6	0	6	1.2	2.7
Monohelea sp.	1	0	0	2	0	3	0.6	0.9
DIPTERA:Chironomidae	337.1	754.1	835.5	420	396	2742.7	548.5	228.6
Subfam.-Tanypodinae	70.7	75.5	88.6	100.8	32	367.6	73.5	26.0
Ablabesmyia (s.str.) monilis	0	15.1	26.6	0	14	55.7	11.1	11.3
Ablabesmyia (Karelia) illinoensis	6.7	15.1	0	12.6	10	44.4	8.9	5.9
Ablabesmyia (Karelia) peleensis	0	0	0	4.2	0	4.2	0.8	1.9
Clinotanypus (s.str.) pinguis	0	0	0	4.2	0	4.2	0.8	1.9
Conchapelopia sp.	20.2	15.1	17.7	8.4	0	61.4	12.3	8.2
Guttipelopia guttipennis	0	0	0	0	1	1	0.2	0.4
Labrundinia sp.1	0	0	0	0	1	1	0.2	0.4
Larsia berneri	0	0	8.9	0	0	8.9	1.8	4.0
Larsia canadensis	0	0	0	4.2	0	4.2	0.8	1.9
Procladius (Holotanypus) sp.	43.8	30.2	35.4	67.2	6	182.6	36.5	22.2
Subfam.-Orthocladiinae	33.7	82.9	47.5	63	49	276.1	55.2	18.6
Psectrocladius (s.str.) litofilus	33.7	45.2	29.7	29.4	1	139	27.8	16.3
Psectrocladius (s.str.) simulans	0	0	0	0	14	14	2.8	6.3
Stackelbergina n.sp.	0	30.2	8.9	25.2	0	64.3	12.9	14.1
Zalutschia sp.1	0	7.5	8.9	8.4	34	58.8	11.8	12.9
Subfam.-Chironominae	232.7	595.7	699.4	256.2	315	2099	419.8	213.2
Tribe-Chironomini	219.2	362	327.7	197.4	289	1395.3	279.1	70.0
Chironomus (s.str.) spp.	3.4	30.2	53.1	16.8	106	209.5	41.9	40.3
Cryptochironomus conus	3.4	0	0	0	0	3.4	0.7	1.5
Dicrotendipes leucoscelis	0	37.7	17.7	0	0	55.4	11.1	16.7
Dicrotendipes modestus	50.6	143.3	115.1	109.2	100	518.2	103.6	33.8
Dicrotendipes tritomus	30.3	37.7	8.9	0	1	77.9	15.6	17.4
Endochironomus nigricans	3.4	0	0	0	0	3.4	0.7	1.5
Lauterborniella agrayloides	0	30.2	0	0	1	31.2	6.2	13.4
Microtendipes pedellus	104.5	30.2	88.5	29.4	30	282.6	56.5	36.9
Omisus ?caledonicus	0	0	0	0	43	43	8.6	19.2
Phaenopsectra flavipes	0	7.5	0	0	0	7.5	1.5	3.4
Polypedilum (s.lat.) sp.1	0	0	17.7	0	0	17.7	3.5	7.9
Polypedilum (s.lat.) sp.3	0	0	8.9	4.2	7	20.1	4.0	4.0
Polypedilum (Tripodura) simulans	3.4	0	0	0	0	3.4	0.7	1.5
Pseudochironomus sp. 3	0	30.2	8.9	0	0	39.1	7.8	13.1
Stenochironomus hilaris	0	0	0	0	1	1	0.2	0.4
Tribelos jucundum	20.2	7.5	8.9	37.8	0	74.4	14.9	14.7
Zavreliella marmorata	0	7.5	0	0	0	7.5	1.5	3.4
Tribe-Tanytarsini	13.5	233.7	371.7	58.8	26	703.7	140.7	156.6
Tanytarsus/Micropsectra spp.	13.5	233.7	371.7	58.8	26	703.7	140.7	156.6
DIPTERA:Tabanidae	0	0	0	1	0	1	0.2	0.4
Chrysops sp(p).	0	0	0	1	0	1	0.2	0.4
DIPTERA:Tipulidae	1	0	0	1	0	2	0.4	0.5
Dactylolabis sp.	0	0	0	1	0	1	0.2	0.4
Tipulidae gen. indet. sp.2	1	0	0	0	0	1	0.2	0.4
DIPTERA:Chaoboridae	8	2	1	0	3	14	2.8	3.1
Chaoborus (s.str.) americanus	8	2	1	0	3	14	2.8	3.1
PELECYPODA	1	20	29	6	0	56	11.2	12.8
Pisidium casertanum	1	20	29	6	0	56	11.2	12.8

APPENDIX4

Benthos summary by taxonomic order or sub-family

lists for the low alkalinity lakes surveyed in the fall of 1988.

CLAYTON LAKE OCT 11 1988

NUMBER OF SPECIES

TAXONOMIC NAME	SITE				TOTAL
	1	2	3	4 sub	
NEMATODA				1	1
OLIGOCHAETA	1	1	2	3	4
HIRUDINEA				1	1
AMPHIPODA	1	1	1	1	1
DECAPODA		1		1	1
EPHEMEROPTERA	3	2	3	3	3
ODONATA	2	5	2	4	5
HEMIPTERA	1	2	1	2	3
MEGALOPTERA	2		1		2
TRICHOPTERA	4	2		3	5
LEPIDOPTERA		1			1
COLEOPTERA		1		1	1
DIPTERA TOTAL	24	24	20	14	38
DIPTERA:Ceratopogonidae	5	5	3	4	8
DIPTERA:Chironomidae	18	18	17	10	29
Subfam. Tanypodinae	4	3	2	1	4
Subfam. Orthocladiinae	2	5	4		6
Subfam. Chironominae	12	10	11	9	19
Tribe Chironomini	10	7	8	5	15
Tribe Tanytarsini	2	3	3	4	4
DIPTERA:Chaoboridae	1	1			1
GASTROPODA	1				1
TOTAL SPECIES	39	40	30	34	67

NUMBER OF INDIVIDUALS

TAXONOMIC NAME	SITE				TOTAL
	1	2	3	4 sub	
NEMATODA				1	1
OLIGOCHAETA	2	2	5	5	14
HIRUDINEA				2	2
AMPHIPODA	4	42	5	51	102
DECAPODA		1		1	2
EPHEMEROPTERA	53	19	13	49	134
ODONATA	4	7	2	44	57
HEMIPTERA	1	18	1	30	50
MEGALOPTERA	2		1		3
TRICHOPTERA	6	4		9	19
LEPIDOPTERA		1			1
COLEOPTERA		1		2	3
DIPTERA TOTAL	439	392	131	1116	2078
DIPTERA:Ceratopogonidae	133	66	3	40	242
DIPTERA:Chironomidae	305	325	128	1076	1834
Subfam. Tanypodinae	105	56	32	43	236
Subfam. Orthocladiinae	2	7	7		16
Subfam. Chironominae	198	262	89	1033	1582
Tribe Chironomini	153	224	68	904	1349
Tribe Tanytarsini	45	38	21	129	233
DIPTERA:Chaoboridae	1	1			2
GASTROPODA	1				1
TOTAL INDIVIDUALS	512	487	158	1310	2467

CLYDE LAKE OCT 24 1988

NUMBER OF SPECIES

TAXONOMIC NAME	SITE					TOTAL
	1	2 sub	3	4	5	
OLIGOCHAETA	1	1	1	1	1	1
AMPHIPODA	1	1	1	1	1	1
EPHEMEROPTERA	1		1	1	1	1
ODONATA	2	4	6	3	3	6
HEMIPTERA	1	3	3	2	3	5
TRICHOPTERA	5	5	4	7	7	13
COLEOPTERA	1			1	1	2
DIPTERA TOTAL	19	13	15	17	24	30
DIPTERA:Ceratopogonidae	1	1	2	3	5	5
DIPTERA:Chironomidae	17	11	10	12	18	22
Subfam. Tanypodinac	3	2	3	3	3	4
Subfam. Orthocladiinae	3	1	1	2	3	3
Subfam. Chironominae	11	8	6	7	12	15
Tribe Chironomini	9	7	6	7	12	13
Tribe Tanytarsini	2	1	1		1	2
DIPTERA:Tabanidae	1		1	1	1	1
DIPTERA:Tipulidae			1			1
DIPTERA:Chaoboridae		1	1	1		1
TOTAL SPECIES	31	27	31	33	41	59

NUMBER OF INDIVIDUALS

TAXONOMIC NAME	SITE					TOTAL
	1	2 sub	3	4	5	
OLIGOCHAETA	1	1	1	6	7	16
AMPHIPODA	40	22	10	38	26	136
EPHEMEROPTERA	4		2	12	5	23
ODONATA	78	16	21	41	109	265
HEMIPTERA	3	3	27	5	54	92
TRICHOPTERA	19	33	8	40	32	132
COLEOPTERA	1			1	2	4
DIPTERA TOTAL	530	711	185	312	581	2319
DIPTERA:Ceratopogonidae	2	3	7	33	88	133
DIPTERA:Chironomidae	527	706.1	173	277	492	2175
Subfam. Tanypodinac	106	191	128	59	151	635
Subfam. Orthocladiinae	1			1	10	12
Subfam. Chironominae	206	403	35	138	277	1059
Tribe Chironomini	202	395	34	138	276	1045
Tribe Tanytarsini	4	7	1		1	13
DIPTERA:Tabanidae	1		2	1	1	5
DIPTERA:Tipulidae			1			1
DIPTERA:Chaoboridae		2	2	1		5
TOTAL INDIVIDUALS	676	786.1	254	455	816	2987.1

DOUGHNUT LAKE OCT 27 1988

NUMBER OF SPECIES

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
NEMATODA				1		1
OLIGOCHAETA	1	1		1	3	3
HIRUDINEA				1	1	1
AMPHIPODA	1	2	1	1	1	2
EPHEMEROPTERA	3	2	3	2	2	3
ODONATA	4	3	2	4	2	5
HEMIPTERA	2	1		2	2	2
TRICHOPTERA	3	2	5	8	3	9
COLEOPTERA	1	2		4	4	5
DIPTERA TOTAL	26	23	25	36	27	42
DIPTERA:Ceratopogonidae	3	5	5	6	4	6
DIPTERA:Chironomidae	22	18	20	28	22	33
Subfam. Tanypodinae	3	3	2	4	3	5
Subfam. Orthocladiinae	3	2	2	5	4	5
Subfam. Chironominae	16	13	16	19	15	23
Tribe Chironomini	14	11	14	16	14	20
Tribe Tanytarsini	2	2	2	3	1	3
DIPTERA:Tabanidae				1	1	1
DIPTERA:Chaoboridae	1					1
DIPTERA:Misc.				1		1
PELECYPODA	1	1	1	1		1
TOTAL SPECIES	42	37	37	61	45	74

NUMBER OF INDIVIDUALS

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
NEMATODA				1		1
OLIGOCHAETA	2	4		15	11	32
HIRUDINEA				1	2	3
AMPHIPODA	15	14	24	22	10	85
EPHEMEROPTERA	13	16	24	22	10	69
ODONATA	14	8	15	44	14	95
HEMIPTERA	13	2		15	19	49
TRICHOPTERA	5	3	14	39	7	68
COLEOPTERA	2	9		13	13	37
DIPTERA TOTAL	329	226	386	753	315	2009
DIPTERA:Ceratopogonidae	34	37	19	105	40	235
DIPTERA:Chironomidae	294	189	367	640	274	1764
Subfam. Tanypodinae	71	57	46	32	39	245
Subfam. Orthocladiinae	5	4	3	36	11	59
Subfam. Chironominae	218	128	318	572	224	1460
Tribe Chironomini	197	123	302	506	218	1346
Tribe Tanytarsini	21	5	16	66	6	114
DIPTERA:Tabanidae				7	1	8
DIPTERA:Chaoboridae	1					1
DIPTERA:Misc.				1		1
PELECYPODA	9	5	5	1		20
TOTAL INDIVIDUALS	402	287	468	926	401	2468

HUNTER'S LAKE OCT 18 1988

NUMBER OF SPECIES

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
	sub	sub	sub	sub	sub	
NEMATODA	1			1		1
OLIGOCHAETA	1	2		1	1	3
AMPHIPODA		1		2		2
HYDRACARINA		1			1	1
EPHEMEROPTERA	3	3	3	3	3	3
ODONATA	6	6	5	7	8	8
HEMIPTERA	3	2	2	1		3
MEGALOPTERA	1	1	1	1	1	1
TRICHOPTERA	5	3	6	6	8	11
LEPIDOPTERA	1					1
DIPTERA TOTAL	13	15	14	15	14	24
DIPTERA:Ceratopogonidae	2	4	3	5	5	5
DIPTERA:Chironomidae	11	11	11	10	9	19
Subfam. Tanypodinae	3	2	1	2	1	3
Subfam. Orthocladiinae	1	3	2	4	1	4
Subfam.Chironominae	7	6	8	4	7	12
Tribe Chironomini	7	5	7	4	7	11
Tribe Tanytarsini		1	1			1
PELECYPODA		1			1	1
TOTAL SPECIES	34	35	31	37	37	59

NUMBER OF INDIVIDUALS

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
	sub	sub	sub	sub	sub	
NEMATODA	1			5		6
OLIGOCHAETA	1	3		1	1	6
AMPHIPODA		1		2		3
HYDRACARINA		1			1	2
EPHEMEROPTERA	91	45	28	304	99	567
ODONATA	236	92	51	108	449	936
HEMIPTERA	2	3	2	1		8
MEGALOPTERA	28	12	3	37	13	93
TRICHOPTERA	8	6	13	37	20	84
LEPIDOPTERA	5					5
DIPTERA TOTAL	1177	1570	1311	5961	2518	12536
DIPTERA:Ceratopogonidae	34	57	19	77	60	247
DIPTERA:Chironomidae	1143	1513	1292	5884	2458	12289
Subfam. Tanypodinae	229	182	116	647	197	1370
Subfam. Orthocladiinae	11	197	181	1530	639	2558
Subfam.Chironominae	903	1135	995	3707	1622	8361
Tribe Chironomini	903	1120	982	3707	1622	8333
Tribe Tanytarsini		15	13			28
PELECYPODA		2			2	4
TOTAL INDIVIDUALS	1549	1735	1407.9	6456	3103	14250.4

PINE LAKE OCT 31 1988

NUMBER OF SPECIES

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
			sub			
OLIGOCHAETA	1	2	3	1	2	3
HIRUDINEA	2	2	1	1		3
AMPHIPODA	2	2	2	1	2	2
DECAPODA				1		1
HYDRACARINA				1		1
EPHEMEROPTERA	3	3	3	4	3	4
ODONATA	4	4	5	3	5	8
HEMIPTERA	2	2		1		3
TRICHOPTERA	6	10	8	8	5	15
COLEOPTERA			1			1
DIPTERA TOTAL	30	36	23	30	33	46
DIPTERA:Ceratopogonidae	4	5	4	4	5	6
DIPTERA:Chironomidae	25	30	18	25	28	36
Subfam. Tanypodinae	5	4	4	5	7	8
Subfam. Orthocladiinae	6	8	3	5	6	8
Subfam. Chironominae	14	18	11	15	15	20
Tribe Chironomini	12	15	9	11	12	16
Tribe Tanytarsini	2	3	2	4	3	4
DIPTERA:Tabanidae	1	1	1			3
DIPTERA:Misc.				1		1
PELYCOPODA	1	1	1	1	1	2
TOTAL SPECIES	51	62	47	52	51	89

NUMBER OF INDIVIDUALS

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
			sub			
OLIGOCHAETA	7	14	10	1	7	39
HIRUDINEA	4	4	3	1	0	12
AMPHIPODA	41	229	60	6	85	421
DECAPODA						1
HYDRACARINA				1		1
EPHEMEROPTERA	120	181	441	217	340	1299
ODONATA	11	14	19	4	20	68
HEMIPTERA	2	3		2		7
TRICHOPTERA	36	32	25	15	10	118
COLEOPTERA			4			4
DIPTERA TOTAL	252	835	1191	409	333	3020
DIPTERA:Ceratopogonidae	20	90	141	99	89	439
DIPTERA:Chironomidae	231	744	1049	303	244	2571
Subfam. Tanypodinae	50	79	126	36	49	340
Subfam. Orthocladiinae	21	245	157	29	23	475
Subfam. Chironomidae	160	420	766	238	172	1756
Tribe Chironomini	142	271	682	200	138	1433
Tribe Tanytarsini	18	149	84	38	34	323
DIPTERA:Tabanidae	1	1	1			3
DIPTERA:Misc.				7		7
PELYCOPODA	4	1	2	10	2	19
TOTAL INDIVIDUALS	477	1313	1755.2	666	797	5009.2

PIPIO LAKE OCT 24 1988

NUMBER OF SPECIES

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
		sub				
OLIGOCHAETA	1	2			1	2
HIRUDINEA	1		1			1
AMPHIPODA	1	1	1	1	1	1
EPHEMEROPTERA	1	1	2	2	2	2
ODONATA	9	7	5	6	6	11
HEMIPTERA	4	7	4	5	1	10
MEGALOPTERA					1	1
TRICHOPTERA	4	8	4	7	4	10
LEPIDOPTERA	1	1			1	2
COLEOPTERA	5	3	1	7	4	10
DIPTERA TOTAL	24	24	17	25	19	36
DIPTERA:Ceratopogonidae	5	4	3	4	3	5
DIPTERA:Chironomidae	18	18	12	21	16	28
Subfam. Tanypodinae	2	3	3	4	2	4
Subfam. Orthocladiinae	4	3	2	4	3	5
Subfam. Chironominae	12	12	7	13	11	19
Tribe Chironomini	10	11	6	11	10	17
Tribe Tanytarsini	2	1	1	2	1	2
DIPTERA:Tabanidae		1	1			1
DIPTERA:Culicidae	1					1
DIPTERA:Misc.		1	1			1
PELECYPODA			1	1	1	1
TOTAL SPECIES	51	54	36	54	41	87

NUMBER OF INDIVIDUALS

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
		sub				
OLIGOCHAETA	1	2			1	4
HIRUDINEA	1		1			2
AMPHIPODA	196	177	161	333	491	1358
EPHEMEROPTERA	17	163	35	183	74	472
ODONATA	77	165	35	51	32	360
HEMIPTERA	23	62	6	14	7	112
MEGALOPTERA					1	1
TRICHOPTERA	29	119	36	67	33	284
LEPIDOPTERA	1	1			1	3
COLEOPTERA	26	22	1	53	39	141
DIPTERA TOTAL	427	1349	99	393	109	2380
DIPTERA:Ceratopogonidae	26	90	13	21	8	158
DIPTERA:Chironomidae	400	1254	85	372	101	2212
Subfam. Tanypodinae	18	276	28	26	6	354
Subfam. Orthocladiinae	50	339	10	156	27	5
Subfam. Chironominae	332	639	47	190	68	19
Tribe Chironomini	299	539	46	169	60	1113
Tribe Tanytarsini	33	100	1	21	8	163
DIPTERA:Tabanidae		5	1			6
DIPTERA:Culicidae	1					1
DIPTERA:Misc.		1		2		3
PELECYPODA			3	6	4	13
TOTAL INDIVIDUALS	798	2059.8	377	1100	792	5129.8

SUGARBUSH LAKE OCT 31 1988

NUMBER SPECIES

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
				sub		
OLIGOCHAETA	1	1	2	1		3
HIRUDINEA	1			1		2
AMPHIPODA	1	1	1	1	1	1
EPHEMEROPTERA	2	1	2	2	2	2
ODONATA	8	4	3	6	3	9
HEMIPTERA	2	3	4	5	5	5
MEGALOPTERA			1			1
TRICHOPTERA	6	6	5	11	5	13
LEPIDOPTERA		1				1
COLEOPTERA		1	5			6
DIPTERA TOTAL	19	32	18	14	31	44
DIPTERA:Ceratopogonidae	1	2	1	4	1	5
DIPTERA:Chironomidae	18	27	16	8	30	34
Subfam. Tanypodinae	3	5	2	1	3	6
Subfam. Orthocladiinae	3	6	5	1	3	9
Subfam. Chironominae	12	16	9	6	24	19
Tribe Chironomini	10	14	8	5	11	16
Tribe Tanytarsini	2	2	1	1	1	3
DIPTERA:Tabanidae		1		1		2
DIPTERA:Misc.		2	1	1		3
PELECYPODA	1			1	1	2
TOTAL SPECIES	41	50	41	42	48	89

NUMBER OF INDIVIDUALS

TAXONOMIC NAME			SITE			TOTAL
	1	2	3	4	5	
				sub		
OLIGOCHAETA	1	1	2	2		6
HIRUDINEA	1			3		4
AMPHIPODA	40	17	22	25	4	108
EPHEMEROPTERA	135	238	176	404	547	1500
ODONATA	45	51	3	34	3	136
HEMIPTERA	2	12	19	159	15	207
MEGALOPTERA			1			1
TRICHOPTERA	39	136	30	55	13	273
LEPIDOPTERA		1				1
COLEOPTERA		1	70			71
DIPTERA TOTAL	308	578	76	1612	86	2660
DIPTERA:Ceratopogonidae	9	9	2	37	1	58
DIPTERA:Chironomidae	299	565	72	1574	85	2595
Subfam. Tanypodinae	28	89	3	16	5	141
Subfam. Orthocladiinae	27	120	32	16	22	217
Subfam. Chironominae	244	356	37	1543	58	2238
Tribe Chironomini	232	270	33	1495	45	2075
Tribe Tanytarsini	12	86	44	47	13	162
DIPTERA:Tabanidae		2				2
DIPTERA:Misc.		2	2	1		5
PELECYPODA	1			13	1	15
TOTAL INDIVIDUALS	572	1035	399	2306.9	669	4981.9

TONAKELA LAKE OCT 19 1988

NUMBER OF SPECIES

TAXONOMIC NAME	SITE					TOTAL
	1	2	3	4	5	
	sub	sub	sub	sub		
NEMATODA		1				1
OLIGOCHAETA		2		1		2
AMPHIPODA	1	1	1	1	1	1
HYDRACARINA	1		1	1	1	1
EPHEMEROPTERA	2	1	2	1	1	2
ODONATA	3	3	4	3	4	6
HEMIPTERA	1	2	1	1	1	3
TRICHOPTERA	5	4	6	6	7	12
LEPIDOPTERA					1	1
COLEOPTERA		2	2		2	4
DIPTERA TOTAL	18	21	24	21	20	44
DIPTERA:Ceratopogonidae	3	2	6	4	2	8
DIPTERA:Chironomidae	13	18	17	15	17	32
Subfam. Tanypodinae	3	4	4	6	5	10
Subfam. Orthocladiinae	1	3	3	3	3	4
Subfam. Chironominae	9	11	10	6	9	18
Tribe Chironomini	8	10	9	5	8	17
Tribe Tanytarsini	1	1	1	1	1	1
DIPTERA:Tabanidae				1		1
DIPTERA:Tipulidae	1			1		2
DIPTERA:Chaoboridae	1	1	1		1	1
PELECYPODA	1	1	1	1		1
TOTAL SPECIES	32	38	42	36	38	78

NUMBER OF INDIVIDUALS

TAXONOMIC NAME			SITE			TOTAL
	1	2	3	4	5	
	sub	sub	sub	sub		
NEMATODA		1				1
OLIGOCHAETA		3		2		5
AMPHIPODA	38	20	15	43	28	144
HYDRACARINA	1		1	1	4	7
EPHEMEROPTERA	18	13	5	4	5	45
ODONATA	85	232	254	123	151	845
HEMIPTERA	5	3	2	1	1	12
TRICHOPTERA	102	53	39	12	22	228
LEPIDOPTERA					1	1
COLEOPTERA		6	2		6	14
DIPTERA TOTAL	358	797	921	462	408	2946
DIPTERA:Ceratopogonidae	12	41	84	40	9	186
DIPTERA:Chironomidae	337	754	836	420	396	2743
Subfam. Tanypodinae	71	76	89	101	32	368
Subfam. Orthocladiinae	34	83	48	63	49	276
Subfam. Chironominae	233	596	699	256	315	2099
Tribe Chironomini	219	362	328	197	289	1395
Tribe Tanytarsini	14	234	372	59	26	704
DIPTERA:Tabanidae				1		1
DIPTERA:Tipulidae	1			1		2
DIPTERA:Chaoboridae	8	2	1		3	14
PELECYPODA	1	20	29	6		56
TOTAL INDIVIDUALS	608.1	1148.1	1267.5	654	626	4303.7

APPENDIX 5

TAXONOMIC REFERENCES

USED IN THE IDENTIFICATION OF THE BENTHIC INVERTEBRATES

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